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BEFORE THE ARIZONA CORPORATION COMMISSION

COMMISSIONERS
MIKE GLEASON - CHAIRMAN
WILLIAM A. MUNDELL
JEFF HATCH-MILLER
KRISTIN K. MAYES
GARY PIERCE

IN THE MATTER OF THE APPLICATION OF UNS GAS, INC. FOR APPROVAL OF A PROPOSED DEMAND-SIDE MANAGEMENT PORTFOLIO FOR 2008-2012.	DOCKET NO. G-04204A-07-0274 **NOTICE OF FILING**

UNS Gas, Inc. ("UNS Gas"), through undersigned counsel, hereby submits certain clarifications to its Demand-Side Management Program Portfolio Plan ("DSM Portfolio"), filed with the Arizona Corporation Commission ("Commission") on May 4, 2007.

I. INTRODUCTION.

UNS Gas reviewed the programs filed in its DSM Portfolio, and identified items which needed clarification; these items are identified below. UNS Gas was advised by Commission Staff to submit these clarifications to Docket Control in the form of 'replacement' pages. Therefore, UNS Gas includes with this filing the replacement pages for specified programs. UNS Gas is also including the redline drafts of these replacement pages as Exhibit 1, incorporated herein by this reference, for ease of review.

Additionally, in response to comments by various parties regarding the UNS Gas DSM Portfolio, UNS Gas modified the delivery mechanism, and the measurement and evaluation plans, for other programs.

II. SUMMARY OF CHANGES.

A. Low Income Weatherization Program, DSM Portfolio, Attachment 1:

- Replace the Table of Contents (i) and pages 2, 3, 4, 5, 6 and 7 of the original document with the Table of Contents (i) and pages 2, 3, 4, 5, 6 and 7 attached hereto.

- Replace Appendices 1, 2 and 3 of the original document with Appendices 1 (pages 8 - 39), 2 (pages 40 - 45) and 3 (page 46) attached hereto.

B. Residential New Construction Program, DSM Portfolio, Attachment 2:

- Replace the Table of Contents (i) and page 4 of the original document with page 4 attached hereto.
- Replace Appendix 4 of the original document with Appendix 4 (page 28) attached hereto.

C. Efficient Home Heating Program, DSM Portfolio, Attachment 3:

- Replace page 4 of the original document with page 4 attached hereto.
- Replace Appendix 1 of the original document with Appendix 1 (page 9) attached hereto.

RESPECTFULLY SUBMITTED this 13th day of November, 2007.

UNS GAS, INC.

By Michelle Livengood

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Original and 13 copies of the foregoing
filed this 13th day of November 2007 with:

Docket Control
Arizona Corporation Commission
1200 West Washington Street
Phoenix, Arizona 85007

Copy of the foregoing hand-delivered/mailed
this 13th day of November 2007 to:

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Low Income Weatherization Program, DSM Portfolio, Attachment 1

Low Income Weatherization Program

Table of Contents

service territory may differ in the type and age of construction but one thing in common is that caulking and weather-stripping as well as heating, cooling and water heating equipment will be severely degraded. Many homes will not meet even minimum code requirements for electrical, mechanical, or plumbing.

Program Eligibility

All existing single family homes and mobile homes that receive gas service from UNSG, with household income at or below the guidelines established by the Arizona Department of Energy Weatherization will be eligible for participation. Homes must be owner-occupied or owners who have rental property occupied by low-income participants must sign off to approve any work completed by agencies. All participants must have household income levels at or below 150% of the poverty level.

NACOG, CCCS, WACOG, SEACAP and other participating agencies will determine the customer priority based on a number of factors including but not limited to:

- No heat (winter) or no cooling (summer) is high priority;
- Elderly and minor children;
- Physical handicap or illness; and
- Number of people in household.

Some agencies also conduct work related to Emergency Home Repair as funding is available. These homes may not necessarily require weatherization measures, but UNSG believes they present additional opportunities for agencies to include some basic and quick installations of energy saving measures. UNSG will request installation of low-flow shower heads, faucet aerators, CFLs and hot water heater blankets, if necessary, when agencies complete Emergency Home Repair work. UNSG believes that these additions during an Emergency Home Repair visit add value to each customer and bolster energy and demand reductions.

Program Rationale

State, local, and federal funding for assistance to low-income customers falls far short of the need that currently exists. Available funding also limits the amount of dollar benefit per household, the type of work it is used for and the amount of dollars allowed for program implementation and administration. Agencies also are limited on the number of homes they can weatherize each year because of a shortage of skilled labor to complete the necessary work, funding to add skilled labor, and the ability to find outside contractors to complete the work.

UNSG funding allows agencies the ability to leverage other funds provided by the Federal Department of Energy ("DOE") and the Low Income Home Energy Assistance Program ("LIHEAP"). UNSG funding allows agencies to complete additional home repair, equipment repair or replacement, and nominal weatherization steps that impact energy consumption. Data provided by NACOG indicates that low-income customers that it serves receive $2.32 of energy efficiency improvements for every $1.00 funded by UNSG because of the ability to leverage other funds. As a result, agencies are able to complete more thorough repair or renovation on each home.

Low Income Weatherization Program

Program Objectives

- Coordinate with Department of Commerce Energy Office (AEO) to follow approved state Weatherization Assistance Program (WAP) rules when using funding from UNSG (Appendix 1);
- Allow up to $2,000 per residence for weatherization, equipment repair, etc. for low-income customers. Agencies may request a waiver of the $2,000.00 limitation on a case-by-case basis;
- Increase the number of homes weatherized or the extent of repair completed at each home;
- Lower the average household energy consumption for low-income customers; and
- Improve the quality of life for low-income customers.

Products and Services Provided

Allowable weatherization measures to meet the WAP rules can be placed in four major categories: 1) duct repair; 2) pressure management/infiltration control; 3) attic insulation; and 4) the repair or replacement of appliances which are not operational or pose a health hazard. Typical services include installing insulation, sealing ducts and balancing air-flow, pressure diagnostics and repair, tuning and repairing cooling and heating systems, and reducing heat gain through windows. Agency representatives will determine from an audit or on-site analysis of the building, which items meet the cost-effectiveness test and will be installed in each home.

Agencies will be allowed to use UNSG funding up to the maximum allowance of $2,000 per home. Funding provided to LIW agencies from Department of Energy (DOE) limits installation of items installed to only those measures that combined, contribute a minimum of 20% energy savings due to LIHEAP DOE requirements. Funding from UNSG will be limited to installation of measures which meet the cost-effectiveness tests and priority outlined in the WAP rules.

Agencies will be asked to install certain energy saving products in any home they enter through the emergency repair and/or flood repair programs. This will support an increase in installation of low-flow shower heads, faucet aerators, CFLs or hot water heater blankets.

The WAP rules also consider combustion safety, a critical step to assure the health and safety of occupants. Agencies are allowed to complete with UNSG funding, any work related to health and safety that is normally considered in the WAP rules but funding for health and safety repairs must not exceed 25% of the available funds for each home and will be reported separately.

Delivery Strategy and Administration

- Promotion of the LIW Program will occur through NACOG, CCCS, WACOG and SEACAP;
- Funding will be provided to agencies from UNSG upon documentation of work completed;
- NACOG, CCCS, WACOG and SEACAP will determine participant eligibility and priority and will complete all work;

- NACOG , CCCS, WACOG and SEACAP will provide program administration, marketing, planning, coordination, labor, materials, equipment and entering results into tracking software; and
- The participating agencies will complete the on-line process outlined by AEO for data collection and data input and the AEO will work with UNSG to provide reports necessary for ACC reporting requirements.

Marketing and Communications

When appropriate, UNSG employees inform customers about the program, local Department of Economic Security ("DES") representatives make referrals, health care service agencies and individual case workers also make referrals. UNSG provides a page on its Web site that directs interested parties to call the NACOG, CCCS, WACOG or SEACAP.

Program Implementation Schedule

UNSG intends to continue the existing LIW Program until the implementation of any new program elements. This will provide time to transition agencies to new program elements following approval by ACC.

Table 1 shows the estimated timeline for key program activities by quarter assuming program approval by the ACC by the third quarter of 2007:

Table 1. Program Implementation Schedule

Program Activities	2007				2008				2009			
Continue ongoing LIW program												
New program pre-approval submit												
New program approval (estimated)												
Meetings/Notifications to Agencies												
Implementation by Agencies												
Process evaluation												
Savings verification												
Program redesign as needed												

Monitoring and Evaluation Plan

Development of this new program, requires that Weatherization measures must pass the cost-effectiveness test that is detailed in the state WAP rules. These rules allow certain measures with a priority list for completion. Measures vary by climate zone and type of housing construction. Measures not on the list must be assessed by a computer analysis to determine the economic feasibility and savings will be tracked. UNSG will require agencies to utilize the AEO on-line process to provide information of each measure installed along with the appropriate address, dates, and other information.

UNSG will adopt a strategy that calls for integrated data collection that is designed to provide a quality data resource for program tracking, management and evaluation. This approach will entail the following primary activities:

- **Database management** – As part of program operation, participating agencies will collect the necessary data elements and AEO will provide periodic reporting.
- **Integrated implementation data collection** – UNSG and AEO will establish systems to collect the data needed to support effective program management and evaluation
- **Field verification** – AEO or their designated contractor will conduct field verification of the installation of a sample of measures throughout the implementation of the program.
- **Tracking of savings using deemed savings values** – AEO will develop savings values for each measure and technology promoted by the program, and periodically review and revise the savings values through bill analysis.

Program Budget (Future)

The 2008 program year annual budget of approximately $113,400 will be allocated as shown in Table 2, while Table 3 provides the expected program budgets through 2012, which includes an escalation rate of 3% per year.

Table 2. 2008 Program Budget

Total Program Budget	**$113,400**	**Allocation Rate**
Total Administrative and O&M Cost Allocation		
Managerial & Clerical	$5,897	5.2%
Travel & Direct Expenses	$0	0%
Overhead	$590	0.5%
Total Administrative Cost	***$6,487***	5.7%
Total Marketing Allocation		
Internal Marketing Expense	$0	0%
Subcontracted Marketing Expense	$0	0%
Total Marketing Cost	***$0***	0%
Total Direct Implementation		
Financial Incentives	$96,621	85.2%
Support Activity Labor (Arizona Energy Office)	$3,000	2.6%
Hardware & Materials	$0	0%
Rebate Processing & Inspection	$2,756	2.4%
Total Direct Installation Cost	***$102,377***	90.3%
Total EM&V Cost Allocation		
EM&V / Research Activity	$4,082	3.6%
EM&V Overhead	$454	0.4%
Total EM&V Cost	***$4,536***	4.0%

Table 3. 2008 – 2012 Program Budget

Year	**2008**	**2009**	**2010**	**2011**	**2012**
Total Budget	$113,400	$116,802	$120,306	$123,915	$127,633
Incentives	$96,621	$99,520	$102,506	$105,581	$108,748
Administrative and EM&V Costs	$13,779	$14,282	$14,800	$15,334	$15,885
Support Activity Labor (AEO)	$3,000	$3,000	$3,000	$3,000	$3,000
Incentives as % of Budget	85.2%	85.2%	85.2%	85.2%	85.2%

Estimated Energy Savings

The program expects that, on average 42 low income customers will be served annually throughout UNSG service territory through a combination of all four agencies. The demand and energy savings from this activity are presented in Table 4. The kW and kWh factors used to calculate the savings are based on data from the AEO study of 150 weatherized homes included in Appendix 2[1]. The study provides present value calculations for the measures allowed by WAP. UNSG calculated a future value from the AEO calculations for zone III (Prescott) for evaporative cooling and zone IV (Tucson) for heating. UNSG adjusted heating savings from zone IV for UNSG service territory to account for higher heating degree days, and calculated energy reduction by dividing the dollars saved by the average cost per kWh or average cost per therm. The average per site energy and demand savings per home extracted from the AEO study are estimated to be 260 'equivalent kWh', 353 'equivalent therms' and 0.14 kW and is included in Appendix 3. AEO is analyzing the electric and gas energy used in weatherized homes before and after the weatherization measures are implemented. As the data base grows over time a more accurate picture of the impact of weatherization activities will emerge and savings values will be adjusted accordingly.

Table 4. Low Income Weatherization Program Annual Energy Savings

Energy and Demand Reductions	2008	2009	2010	2011	2012
Number of customers	40	41	42	43	45
Non-coincident peak (kW)	5.69	5.83	5.97	6.11	6.40
Coincident peak (kW)	0.83	0.85	0.87	0.89	0.93
Energy Savings (kWh)	10,383	10,643	10,902	11,162	11,681
Energy Savings (Therms)	14,119	14,472	14,825	15,178	15,884

In addition to the energy savings shown above, it is estimated that the program will produce the additional water and emissions reductions benefits from 2008 – 2012 presented in Table 5.

Table 5. Projected Environmental Benefits, 2008 – 2012

Water Saved (utility only)	12,762	Gallons
CO_2 (electricity savings only)	50,226	Pounds
CO_2 (gas savings only)	878,861	Pounds

Note: A portion of the CO_2, and all of the water benefits are related to electricity savings and are based on Arizona Public Service Co. estimates as presented in the "APS Demand Side Management Program Portfolio 2005-2007," p. 20.

Program Cost Effectiveness

Program cost-effectiveness for the Low Income Weatherization program is evaluated based on the customer economic impact for participation in the program. Unlike the other programs proposed in UNSG's overall DSM portfolio which measure program cost-effectiveness based on societal benefit/cost tests and utility avoided costs, the benefit/cost of the low income program is evaluated based on the customer economics for personal participant savings versus program costs. This approach is consistent

[1] Report titled "Present Value Analysis, SWG Low-Income Weatherization Program July 1, 1999 to June 31, 2000" provided by the Arizona Energy Office, August, 2007 as the basis for estimating measure savings for low income customers.

with the benefit/cost methodology used by the Arizona Energy Office and as used in Arizona Public Service Company's Low Income Weatherization program filings.

Table 6. Estimated UNSG Weatherization Savings per Home

Savings Per Home	Units Saved/Yr	Savings/Yr/House	Savings/House/Measure Life
kWh	260	$26	$393
Therms	353	$487	$7,307
kW	0.02	n/a	n/a
TOTAL		$513	$7,700

Measure life	15
$/kWh	0.101
$/therm	1.38
Houses Served (2008-2012)	211

Table 7. Program Benefit/Cost: Based on Participant Economics for KWh and Therm Savings (2008-2012)

Savings	Low Income Total Participant Benefits	Total Program Costs	Net Benefits	Benefit/Cost Ratio
Participants Lifetime kWh & Therm Savings	$1,624,711	$602,056	$1,022,655	2.70

Appendix 1: Weatherization Assistance Program Requirements

JULY 1, 2006
EDITION

CONTRACTUAL REQUIREMENTS

Financial Report and Budget Line Item Definitions

Administrative Costs
Cost of expenses incurred by the CONTRACTOR, but not directly attributed to the implementation of Weatherization or not easily segregated from the larger overhead or indirect costs of operating the Contractor's organization such as janitorial costs, executive director, finance officer, utility costs, reception area costs and related indirect costs.

Audit Costs
Cost of A-133 audit participation and costs of a Weatherization Assistance Program compliance audit.

Commerce
Arizona Department of Commerce.

Field Position(s) Expense(s).
Salary and employee related costs incurred for CONRACTOR program personnel serving as Weatherization crew technicians, energy auditors and field supervisors.

Other Program Support Expenses
Costs incurred for postage, telephone lines and service, printing and copying, general office supplies, computer hardware acquisition and computer software acquisition. Building permits and fees necessary to the accomplishment of certain actions and investments upon a client and dwelling unit.

Other Program Support Position(s) Expense(s)
Salary and employee related costs incurred for CONTRACTOR program personnel serving in the capacity of any other program function but who are not in the field installing action items or directly supervising the activities of technicians who are engaged in the installation of action items.

Program Liability Insurance
Costs of obtaining liability insurance for the CONTRACTOR so that in the event of agency malfeasance or accident, the CONTRACTOR will have the financial resources necessary for restoration of property or to person(s).

Program Storage and Workshop Space
Costs incurred for the provision of materials storage and program work space such as workshops, tools and equipment storage space, program office area for energy auditors, field supervisors, inventory control specialist, out of workers, accountants, et al.

Program Vehicle Capital Expense
The initial cost of acquisition of program vehicles including all related costs involved in such investments.

Program Transportation Operations Expenses
The cost of mileage reimbursement; vehicle registration, vehicle insurance, maintenance (oil changes, tune-ups, etc.) and major repair & replacement (tires, batteries, fuel pump, alternators, brake job, etc.) and automotive fuels.

Sub Contracted Installation Expenses
The cost of any action item or measure installed by other than the crew of a subgrantee.

Sub Contracted Health & Safety Investments
The total cost of action items or measures installed by other than the crew of a subgrantee that do not meet the cost effectiveness tests of energy efficiency investments.

Subgrantee Installed Materials
The cost of any action item or measure funded under this contract, as installed by the technicians employed by the Weatherization Assistance Program subgrantee, will be reimbursed with the exception of items listed under Health & Safety.

Subgrantee Installed Health & Safety Investments
Those materials and products installed by the subgrantee's technicians that do not meet cost effective energy investment tests.

Other Program Support Expenses
Costs incurred for postage, telephone lines & service, printing, copying, general office supplies, computer hardware and software acquisition. Building permits and fees necessary to the accomplishment of certain actions and investments upon a client dwelling unit.

Tools and Equipment
The acquisition of all tools and equipment whether expendable such as drill bits, sanding paper, or major investment like power tools, diagnostic equipment such as blower doors.

Training and Technical Expenses
Cost of travel and/or registration to approved meetings, conferences, training, workshops and cost of retaining Commerce approved trainers and consultants.

Weatherization
Weatherization Assistance Program.

Reimbursement Procedures

Reimbursement requests shall be submitted on a monthly basis. The request shall include the following reporting elements:

- Invoice
- Financial Status Report (FIN)

Reimbursement request will be processed for payment upon determination that all reporting elements have met Weatherization contractual requirements. If reimbursement requests that do not meet Weatherization contractual requirements, Commerce will provide a report listing areas out of compliance and remedies needed to bring request into compliance.

Reporting Procedure

Invoice shall include name of agency, reporting month, commerce contract number, funding source, and amount per funding source, signature, and date

Financial Status Report shall show per line item current expenditures of the reporting period as well as cumulative expenditures to date.

Invoice and Financial reports shall be mailed and received by Commerce on the twelfth (12th) working day of the month on or before 5:00 P.M. taking into consideration any State holiday.

Copies of all reports shall be mailed to:

Arizona Department of Commerce
Energy Office
1700 W. Washington, Suite 220
Phoenix, Arizona 85007

Applicant Reports shall be submitted in an electronic format. Reports shall include names and addresses of persons serviced, existing condition of unit, breakdown and totals for owner and rental units, different type of occupancy and on-site investment. Totals of applications pending shall be included.

For each dwelling unit completed, a set of data supporting work performed by funding source, to include Pressure Diagnostics and Combustion Safety results, shall be submitted.

PROGRAM ELIGIBILITY REQUIREMENTS

Eligible Population

Arizona's defines "low-income" for eligible purposes as follows:

- Income is at or below 150% of the federal poverty level determined in accordance with criteria established by the Office of the Secretary, US. Department of Health and Human Services.
- The household includes members who has received cash assistance payments under AFDC or SSI, are automatically eligible for Weatherization assistance.
- For income from Social Security Administration Benefits-SSA benefits (sometimes referred to as RSDI – retirement, survivors, and disability insurance) granted to eligible wages earners and/or their dependants or survivors. DO NOT INCLUDE THE MEDICARE DEDUCTION IN THE TOTAL AMOUNT

Certification of Income Eligibility

An authorized representative of the CONTRACTOR shall inspect at least one document from the following list of acceptable documents before certifying the program applicant household as being income eligible for Weatherization services available under this contract. Acceptable documents for purpose of this provision are the following:

AFDC, SSI, or General Welfare award letter or document, Social Security Statement of earnings, Income tax return for prior year. The income test period is for the twelve (12) months prior to the date of application for program benefits under this contract. Recertification of income eligibility is required if 180 days or more have elapsed from the initial application date, and Weatherization work has not commenced on the applicant's dwelling.

Priorities

Priorities shall be given to the following eligible populations:

- Elderly
- Handicapped
- High energy consuming housing

REQUIRED PROGRAM ANNOUNCEMENT

CONTRACTOR shall announce the availability of Weatherization services as provided by this contract.

The program announcement shall provide all potentially interested and income eligible families with an opportunity to apply for Weatherization assistance. The CONTRACTOR shall provide application services on an outreach basis to applicants who are unable to leave their residences due to a handicap or fear of assault.

The following types of program announcements will satisfy this contract stipulation:

1. Legal advertisement in a newspaper of general circulation in the contractor's service area.

2. Feature article, on receipt of a new Weatherization contract, by the CONTRACTOR in a newspaper of general circulation in contractor's service area.

3. Program flyer or handout announcing the additional program funds or program expansion.

CLIENT FILE REQUIREMENTS

Separate File

A separate file shall be maintained for each household receiving Weatherization assistance under the terms of this contract. The client file shall be retained by the CONTRACTOR for a minimum of five years and be available for inspection by representatives of Commerce with reasonable advance notification.

Program Application Form

The program application form shall make it clear to the Weatherization customer that the household is applying for Weatherization assistance. Funded in part or in whole by grant funds made available to the Arizona Department of Commerce from the following: U.S. Department of Energy (DOE), U.S. Department of Health and Human Services through the Arizona Department of Economic Security for their Low Income Home Energy Assistance Program (LIHEAP), and funds from Southwest Gas Low-Income Energy Conservation Program (SWG).

Fuel Information Release Form

A fuel information release form signed by the applicant to allow the CONTRACTOR or the Arizona Department of Commerce to obtain a utility history for all metered fuels purchased by the applicant household. Applicants who are on a "master metered" system are not required to sign the fuel information release form.

Rental Dwelling

As applicable, no rental dwelling may be weatherized under the terms of this contract unless written permission to perform itemized services is obtained from the owner of the rental unit or the owner's authorized agent. Said written permission is to be retained, along with such other agreements between the CONTRACTOR and the rental owner/agent, as part of the job record and client job file.

A. The fuel information release form shall be signed by the tenant of a rental dwelling prior to the inception of Weatherization services unless the dwelling is part of a master-metered complex in which case this provision does not apply.

B. The owner of the rental property or the owner's agent shall agree in writing not to raise the rental charge of said dwelling for a minimum period of one year from the date of completion of Weatherization services as a consequence of the Weatherization investment.

PROHIBITION AGAINST WEATHERIZATION SERVICES

Dwelling Units

- Dwelling units which are vacant or which are designated for acquisition or clearance by a federal, state, or local program within twelve (12) months from the date of scheduled weatherization shall not be provided Weatherization services under this contract.

- Dwelling units which are known to be for sale as evidenced by "For Sale" signs on the property, realtor listing and offering or classified advertisement, shall not be provided Weatherization services under this contract.

- Weatherization services, under this contract, are prohibited where the dwelling unit of an applicant household is located in a designated flood plain unless said dwelling unit is currently covered by flood insurance.

PRIOR WRITTEN APPROVAL REQUIREMENTS

No work shall proceed or items are purchased until the CONTRACTOR has received prior written approval from Commerce.

Prior Written Approval is required by the Energy Office on the following:

- All purchase lease or lease-purchase (in excess of one week) of vehicles.

- Out-of-state travel charged to contract budget.
- Weatherization training, program sessions, or workshops not sponsored by the Energy Office or DOE, and charged to Weatherization.
- Adjustments to line items in the contract budget
- CONTRACTOR enters into any subcontract.
- Purchase of modular storage building.
- Purchase of extended warranties for installed items on client homes.
- Proposed removal of moldy building structural materials or building contents.
- Low-Income Weatherization services are for existing residential buildings only. Services are not authorized for new additions or residences in varying stages of new construction or remodeling, or for garage/carport conversions in progress unless authorization is obtained in writing for said work by Commerce.
- Homes that have been weatherized and reported to Commerce for contract credit will not be accepted for additional Weatherization assistance unless the CONTRACTOR has been issued prior authorization in writing to proceed.
- Weatherization of master metered dwelling units or where the landlord pays the energy utility services.

INVENTORY

Within twelve working days of execution of this contract the CONTRACTOR shall submit a current list of all inventory available for use in Weatherization. This list shall include:

- Description of inventory, manufacturer's serial number, model number, national stock number, or other identification number
- Acquisition date
- Locations, use, and condition of inventory
- Unit acquisition cost
- Disposition data - date and method of disposal

CONTRACTOR shall submit an updated Program Materials Inventory list at the end of the program year. Inventory list shall include any inventory acquisition, disposition, and condition changes during the program.

Property

All inventories acquired by funds provided through Commerce contract become program property. Title to inventory acquired and defined under the contract may vest upon expiration of the contract provided all terms and conditions of the contract have been met. This is pursuant to Office of Management and Budget (OMB) Circular A-102, 600-432A.

The CONTRACTOR shall indicate Weatherization Program ownership, maintain reasonable control, and be responsible for the proper care and maintenance of all inventories acquired through a contract with Commerce. All inventories lost, stolen, rendered unusable, or no longer required for program operation shall be reported to Commerce within 5 working days.

When the contract is terminated, the disposition of all inventory acquired, with contract funds, shall be determined as follows:

1. Commerce may allow continued use of program inventory provided that a new contract is executed and the inventory continues to be used as originally intended.
2. Commerce may sell inventory to the CONTRACTOR, at fair market value, if the CONTRACTOR wishes to utilize the inventory for purposes other than for which it was acquired. Fair market value will be determined by Commerce.
3. Commerce may take possession of the inventory.

INSTALLATION MEASURES

All materials/measures installed shall be justified utilizing the Energy Audit Procedures established by Commerce.

ENERGY AUDIT PROCEDURE

The Weatherization Assistance Program (WAP) Energy Audit Procedure is to be used by all sub-grantees to gather, record and analyze data on structures. This data is to be used to deliver weatherization materials/measures in a fashion that protects the health and safety of the client, increase the durability of the structure, increases the comfort of the client and reduces the energy cost to the client in a cost effective manner.

The following audit activities must be completed on all homes utilizing WAP funds.

- A site audit is to be completed that records all of the relevant data on the structure that is needed to perform a cost effectiveness test.
- The Cost Effectiveness Procedure must be followed to determine cost effectiveness of potential weatherization materials/measures.
- The Pressure Diagnostic Procedure must be completed and the findings documented following the Reporting Procedures.
- A health and safety audit of the structures must be completed and the findings documented following the Reporting Procedures.
- A final inspection must be of the structure must be completed and findings documented following the Final Inspection Procedures.

COST EFFECTIVENESS PROCEDURE

WAP has incorporated a performance based energy audit procedure that focuses on optimizing investment in energy efficiency through a systems approach. To enable the WAP program to optimize the investment in energy efficiency, the following requirements have been established for the audit procedure:

- The energy audit procedure must determine that each weatherization material/measure is cost effective by ensuring the discounted savings-to-investment ratio (SIR) is greater or equal to one.
- The energy audit procedure must assign priorities among weatherization materials/measures in descending order of SIR and must account for interactions between architectural and mechanical measures.
- The energy audit procedure must ensure that the overall SIR for the entire package of materials/measures, including the cost of incidental repairs, is greater or equal to one. Incidental repairs are only allowed if they are necessary to make the installation of weatherization materials effective.
- Funds spent to abate energy related health and safety hazards do not need to be included in the preceding requirements. Funds can be spent to eliminate health and safety hazards when the elimination of the hazard is necessary before or because of the installation of weatherization materials.
- A waiver must be received from the Energy Office before the installation measures/materials that do not meet the Cost Effectiveness or Health and Safety Requirements established by the WAP program.

To determine the cost effectiveness of weatherization materials/measures, the contractor must use a computer audit approved by the Energy Office or an appropriate priority list for homes that meet the criteria contained in the list.

CLIMATE ZONES

Arizona Climate Zone used for the Cost Effective Priority Lists can be found at
http://www.azcommerce.com/energy/weatherization.asp

FUEL SWITCHING

The Weatherization Assistance Program does not permit the general practice of fuel switching when replacing heating, cooling or water heating equipment. The changing or converting equipment using one fuel source to another will be considered on a limited case-by-case basis only.

A waiver must be received from the Energy Office prior to changing or converting equipment using one fuel source or another.

COST EFFECTIVENESS PRIORITY LIST FOR DETACHED HOUSING

CLIMATE ZONE 1

The priority list can be used to determine cost effective weatherization materials/measures for homes located in Climate Zone 1 (see Climate Zone map). The priority list is comprised of two housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Homes with Gas Heating

- Existing ceiling insulation of R-19 or less upgraded to R-38.
- Uninsulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Water heater wrap (where allowed).

Housing Type Two: Homes with Electric Resistance Heating

- Existing ceiling insulation of R-19 or less upgraded to R-38.
- Uninsulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR DETACHED HOUSING

CLIMATE ZONE 2

The priority list can be used to determine cost effective weatherization materials/measures for homes located in Climate Zone 2 (see Climate Zone map). The priority list is comprised of three housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Homes with Refrigeration Cooling (AC or Heat Pump)

- Existing ceiling insulation of R-19 or less upgraded to R-30.
- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Air Conditioners twenty years old or older upgraded with a minimum 13 SEER unit.
- Shade screens on all sun struck south, east and west windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Two: Homes with Evaporative Cooling Only and Electric Resistance Heating

- Existing ceiling insulation of R-11 or less upgraded to R-30.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Water heater wrap (where allowed).

Housing Type Three: Homes with Evaporative Cooling Only and Gas Heating

- Existing ceiling insulation of R-11 or less upgraded to R-19.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100 or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR DETACHED HOUSING

CLIMATE ZONE 3

The priority list can be used to determine cost effective weatherization materials/measures for homes located in Climate Zone 3 (see Climate Zone map). The priority list is comprised of four housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Homes with Refrigeration Cooling and Electric Heating (Heat Pump or Electric Resistance

- Existing ceiling insulation of R-19 or less upgraded to R-30.
- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Shade screens on all sun struck South, East and West windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Two: Home with Refrigeration Cooling and Gas Heating

- Existing ceiling insulation of R-19or less upgraded to R-30.
- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Shade screens on all sun struck south, east and west windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Three: Homes with Evaporative Cooling Only and Electric Resistance Heating

- Existing ceiling insulation of R-19 or less upgraded to R-30.

- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Water heater wrap (where allowed).

Housing Type Four: Homes with Evaporative Cooling Only and Gas Heating

- Existing ceiling insulation of R-11or less upgraded to R-30.
- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR DETACHED HOUSING

CLIMATE ZONE 4

The priority list can be used to determine cost effective weatherization materials/measures for homes located in Climate Zone 4 (see Climate Zone map). The priority list is comprised of three housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Homes with Refrigeration Cooling (AC or Heat Pump)

- Existing ceiling insulation of R-19 or less upgraded to R-30.
- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Air Conditioners twenty years old or older upgraded with a minimum 13 SEER unit.
- Shade screens on all sun struck south, east and west windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Two: Homes with Evaporative Cooling Only and Electric Resistance Heating

- Existing ceiling insulation of R-11 or less upgraded to R-30.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Water heater wrap (where allowed).

Housing Type Three: Homes with Evaporative Cooling Only and Gas Heating

- Existing ceiling insulation of R-11 or less upgraded to R-30.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR DETACHED HOUSING

CLIMATE ZONE 5

The priority list can be used to determine cost effective weatherization materials/measures for homes located in Climate Zone 5 (see Climate Zone map). The priority list is comprised of four housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Homes with Refrigeration Cooling and Electric Heating (Heat Pump or Electric Resistance

- Existing ceiling insulation of R-19 or less upgraded to R-30.
- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Shade screens on all sun struck east and west windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Two: Homes with Refrigeration Cooling and Gas Heating

- Existing ceiling insulation of R-19 or less upgraded to R-30.
- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Shade screens on all sun struck east and west windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Three: Homes with Evaporative cooling only and Electric Resistance Heating

- Existing ceiling insulation of R-19 or less upgraded to R-30.
- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Water heater wrap (where allowed).

Housing Type Four: Homes with Evaporative Cooling Only and Gas Heating

- Existing ceiling insulation of R-19 or less upgraded to R-30.
- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR DETACHED HOUSING

CLIMATE ZONE 6

The priority list can be used to determine cost effective weatherization materials/measures for homes located in Climate Zone 6 (see Climate Zone map). The priority list is comprised of three housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.

- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Homes with Refrigeration Cooling (AC or Heat Pump)

- Existing ceiling insulation of R-19 or less upgraded to R-30.
- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Air Conditioners twenty years old or older upgraded with a minimum 13 SEER unit.
- Shade screens on all sun struck south, east and west windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Two: Homes with Evaporative Cooling Only and Electric Resistance Heating

- Existing ceiling insulation of R-11 or less upgraded to R-30.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Water heater wrap (where allowed).

Housing Type Three: Homes with Evaporative Cooling Only and Gas Heating

- Existing ceiling insulation of R-11 or less upgraded to R-19.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR MOBILE HOMES

CLIMATE ZONE 1

The priority list can be use to determine cost effective weatherization materials/measures for mobile homes located in Climate Zone 1 (see Climate Zone map). The priority list is comprised of one housing type with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Priority list for Mobile Homes

- Reflective roof coating.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Storm windows on single pane windows (installed cost of under $3 per square foot).
- Replacement of jalousie windows with dual pane windows (installed cost of under $18 per square foot).
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR MOBILE HOMES

CLIMATE ZONE 2

The priority list can be use to determine cost effective weatherization materials/measures for mobile homes located in Climate Zone 2 (see Climate Zone map). The priority list is comprised of three housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Mobile Homes with Refrigeration Cooling (AC or Heat Pump)

- Reflective roof coating.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Air Conditioners twenty years old or older upgraded with a minimum 13 SEER unit.
- Storm windows on single pane windows (installed cost of under $3 per square foot).
- Replacement of jalousie windows with dual pane windows (installed cost of under $8 per square foot).
- Shade screens on all sun struck south, east and west windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Two: Mobile Homes with Evaporative Cooling Only and Electric Resistance Heating

- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Storm windows on single pane windows (installed cost of under $3 per square foot).
- Replacement of jalousie windows with dual pane windows (installed cost of under $4 per square foot).
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Water heater wrap (where allowed).

Housing Type Three: Mobile Homes with Evaporative Cooling Only

- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Replacement of jalousie windows with dual pane windows (installed cost of under $4 per square foot).
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR MOBILE HOMES

CLIMATE ZONE 3

The priority list can be use to determine cost effective weatherization materials/measures for mobile homes located in Climate Zone 3 (see Climate Zone map). The priority list is comprised of three housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Mobile Homes with Refrigeration Cooling

- Reflective roof coating.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Storm windows on single pane windows (installed cost of under $3 per square foot).
- Replacement of jalousie windows with dual pane windows (installed cost of under $10 per square foot).
- Shade screens on all sun struck south, east and west windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Two: Mobile Homes with Evaporative Cooling Only and Electric Resistance Heating

- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Storm windows on single pane windows (installed cost of under $3 per square foot).
- Replacement of jalousie windows with dual pane windows (installed cost of under $10 per square foot).
- Water heater wrap (where allowed).

Housing Type Three: Mobile Homes with Evaporative Cooling Only and Fossil Fuel Heating

- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Replacement of jalousie windows with dual pane windows (installed cost of under $9 per square foot).
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR MOBILE HOMES

CLIMATE ZONE 4

The priority list can be use to determine cost effective weatherization materials/measures for mobile homes located in Climate Zone 4 (see Climate Zone map). The priority list is comprised of three housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Mobile Homes with Refrigeration Cooling (AC or Heat Pump)

- Reflective roof coating.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Air Conditioners twenty years old or older upgraded with a minimum 13 SEER unit.
- Storm windows on single pane windows (installed cost of under $3 per square foot).
- Replacement of jalousie windows with dual pane windows (installed cost of under $7 per square foot).
- Shade screens on all sun struck south, east and west windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Two: Mobile Homes with Evaporative Cooling Only and Electric Resistance Heating

- Reflective roof coating.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Storm windows on single pane windows (installed cost of under $3 per square foot).
- Replacement of jalousie windows with dual pane windows (installed cost of under $4 per square foot).
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Water heater wrap (where allowed).

Housing Type Three: Mobile Homes with Evaporative cooling only and Fossil Fuel Heating

- Reflective roof coating.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Replacement of jalousie windows with dual pane windows (installed cost of under $4 per square foot).
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR MOBILE HOMES

CLIMATE ZONE 5

The priority list can be use to determine cost effective weatherization materials/measures for mobile homes located in Climate Zone 5 (see Climate Zone map). The priority list is comprised of two housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Mobile Homes with Refrigeration Cooling

- Reflective roof coating.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Storm windows on single pane windows (installed cost of under $3 per square foot).
- Replacement of jalousie windows with dual pane windows (installed cost of under $11 per square foot).
- Shade screens on all sun struck east and west windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Two: Mobile Homes with Evaporative Cooling Only

- Reflective roof coating.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Storm windows on single pane windows (installed cost of under $3 per square foot).
- Replacement of jalousie windows with dual pane windows (installed cost of under $10 per square foot).
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR MOBILE HOMES

CLIMATE ZONE 6

The priority list can be use to determine cost effective weatherization materials/measures for mobile homes located in Climate Zone 6 (see Climate Zone map). The priority list is comprised of two housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Mobile Homes with Refrigeration Cooling (AC or Heat Pump)

- Reflective roof coating.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Air Conditioners twenty years old or older upgraded with a minimum 13 SEER unit.
- Shade screens on all sun struck south, east and west windows and glass doors.
- Storm windows on single pane windows (installed cost of under $3 per square foot).
- Replacement of jalousie windows with dual pane, windows (installed cost of under $8 per square foot).
- Water heater wrap (where allowed).

Housing Type Two: Mobile Homes with Evaporative Cooling Only

- Reflective roof coating.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Replacement of jalousie windows with dual pane windows (installed cost of under $3 per square foot).
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

GENERAL WASTE HEAT ITEMS

ALLOWABLE MEASURES WHICH DO NOT REQUIRE A COST EFFECTIVENESS TEST

Domestic Hot Water

- Adjustment of the hot water temperature to 120 degrees if approved by the client.
- Replacement of existing showerhead, which exceeds a flow rate of 2.5 GPM, with a low-flow replacement showerhead if approved by the client.
- Faucet aerators

Space Heating and Cooling Systems

- Equipment maintenance and tune-up.
- Heating or Cooling System setback thermostat(s) for people with mobility problems or other extenuating circumstances, which make it difficult for them to manually adjust thermostat set points.

Existing Evaporative Coolers

- General evaporative cooler tune-ups.
- Replacement of a single speed evaporative cooler motor with a listed two-speed motor.

MEASURES THAT CAN BE FUNDED WITH LIHEAP WAP

- Replacement Hot Water Tanks: Gas fired tanks shall have R-8.3 minimal sidewall insulation. Electric tanks shall have R-11 minimal sidewall insulation.
- Exterior doors.
- Attic ventilation.
- Replacement of wall, ceiling, and floor forced air supply registers when existing condition limits functioning of control louvers.

BASE LOAD ITEMS

ALLOWABLE MEASURES WHICH DO NOT REQUIRE A COST EFFECTIVENESS TEST

- Replacement of incandescent light bulbs, which are on for at least one hour per day, with an ENERGY STAR qualified compact fluorescent bulbs that emit the same amount of light.
- Refrigerators replacement. All replacements must follow the Refrigerator Replacement Policy.

Window Replacements

- Replacements must meet the energy star performance criteria (www.energystar.gov)

PRESSURE DIAGNOSTIC PROCEDURE

The pressure diagnostic procedures are to be followed when performing air leakage diagnostics and repair. These procedures provide crews with immediate feedback on the effectiveness of air sealing work, insure that repairs will provide long-term energy benefit in a safe manner, and provide essential management information needed to monitor the cost effectiveness of the air sealing programs.

Pressure Diagnostic Decision Tree

The pressure diagnostic decision tree provides assistance to agency personnel in identifying the minimum level of pressure testing that needs to be performed to meet the Weatherization Program requirements. The decision tree is comprised of two levels of housing characteristics and corresponding test requirements. In all cases, air sealing can only be performed in conjunction with pressure diagnostics.

Level One: Homes with Central Forced Air Heating or Cooling.

- The **complete** pressure diagnostic process must be followed in all cases on homes with a central forced air heating or cooling system. (Evaporative cooling is not considered a forced air system in this case.)

Level Two: Homes with No Central Forced Air Heating or Cooling

- The use of pressure diagnostic process is **optional** in homes that do not have a central forced air heating or cooling system and that do not contain the characteristics listed below.

    - **Possible cost effective envelope sealing:** Pressure diagnostics must be completed on homes where the cost of space heating and/or cooling provides possible cost effective envelope sealing opportunities.
    - **Combustion appliance zone testing:** The Worst Case Pressure Test must be performed in **all** zones that contain a combustion appliance.

Testing Procedure

When performing pressure diagnostic, crews are required to use the following procedures **IN SEQUENCE.** If a test is not performed, document must be provided in all cases stating the rational for not following the testing procedure.

1. Initial air leakage and room pressure tests
2. Duct repair
3. Envelope air sealing
4. Room pressure balancing

1. Initial Air Leakage and Room Pressure Tests:

These initial tests will provide reference information on the existing condition of the home. This information will be used to determine what retrofit measures are to be completed and their effectiveness.

A. Perform a complete energy audit and combustion safety test of the house. **No pressure testing or air sealing can be done until the required combustion safety procedure is completed.**
B. Perform Room Pressure Tests (dominant duct leakage test, room pressure test, and combustion appliance zone [CAZ] test) and record pressures. List combustion appliances located in rooms tested. **If a pressure of –3 Pascals (Pa) or more exists in a CAZ, or the possibility exists that repair work will create a pressure of –3 Pa or more in a CAZ, corrective action must be completed before or in conjunction with air sealing or duct repair.** Discuss possible corrective action with the client. **If client refuses to allow corrective action to be completed,** no air sealing or duct repair can be completed.

C. Perform zonal pressures and record the results.
D. Perform initial Whole House CFM50 Test and record the results.
E. Perform Pressure Pan Test and record initial pressure difference.
F. Based on the results of the energy audit, combustion safety tests, and pressure tests, determine the extent of work to be completed.

2. Duct Repair Procedure:

A. Duct repair can only be performed under the supervision of a trained technician.
B. The Health and Safety Policy must be followed at all times.
C. Perform duct repair using approved products (see Product Guidelines) and repair techniques (see Duct Repair Techniques).
D. After initial duct repair is performed, evaluate if additional duct repair is possible.
E. Once all attainable duct leakage is repaired, perform post duct repair Whole House CFM50 Test and pressure pan readings. The difference between the initial Whole House CFM50 Test and the post duct repair Whole House CFM50 Test will provide the CFM reduction in duct leakage.

3. Envelope Air Sealing Procedure:

A. All duct repairs must be completed before envelope air sealing.
B. Envelope air sealing can only be performed under the supervision of a trained technician.
C. The Health and Safety Policy must be followed at all times.
D. Perform air sealing with high-quality products. Weatherization products must be permanent and guaranteed for at least 15 years.
E. Repeat Whole House CFM50 Test after air sealing work is performed and evaluate if additional air sealing is possible (see Health and Safety Policy for CFM ventilation requirements).
F. Once air sealing is completed, perform final Whole House CFM50 Test and record results.

4. Room Pressure Balancing:

A. All duct repair and air sealing must be completed before room pressure balancing.
B. Room pressure balancing can only be performed under the supervision of a trained technician.
C. The Health and Safety Policy must be followed at all times.
D. Perform post air sealing room pressure tests (dominant duct leakage test, room pressure test, and worst case test) and record room pressures.
E. Review options to remedy pressure imbalances with the client. If pressure balancing is not performed, record reasons in the work summary.
F. Repeat room pressure tests after initial pressure balancing measures are installed and evaluate if addition pressure balancing is needed.
G. Once pressure balancing is completed, repeat room pressure tests and record results.

Economics

The cost effectiveness of pressure diagnostic and repair is to be based on a comparison of the present value of the reduced air leakage and the cost (labor and materials) to achieve the reduction. The values in the following tables are designed to provide general guidance on the present value of air leakage control.

Infiltration

The following table gives the present value of reducing the infiltration rate by 100 CFM50 for a typical weatherized home.

Present value of 100 CFM50 reduction	Climate Zone 1	Climate Zone 2	Climate Zone 3	Climate Zone 4	Climate Zone 5	Climate Zone 6
	$160	$40	$90	$40	$90	$40

Duct Leakage

The following table gives the present value of reducing duct leakage by 100 CFM50 for a typical weatherized home.

Present Value of 100 CFM reduction	Climate Zone 1	Climate Zone 2	Climate Zone 3	Climate Zone 4	Climate Zone 5	Climate Zone 6
Heating	$800	$90	$345	$95	$385	$50
Cooling*	$10	$450	$80	$300	$100	$870

*If a home has only evaporative cooling, only the heating values will be realized in duct repair.

COMBUSTION SAFETY PROCEDURES

The Combustion Safety procedure records data on combustion appliances in the house, possible health and safety issues with these appliances and the actions taken by the Weatherization program. Because combustion appliances can be the dominant factor in the health and safety of the occupants, it is imperative that the combustion safety procedures are followed in all cases.

Gas Leaks

All gas appliances and plumbing must be checked for possible leaks. List any problems found.

Indoor Carbon Monoxide levels

Tests must be completed on the amount of Carbon Monoxide, in parts per million (PPM), found in the ambient indoor air during appliance operation. An initial test must be performed in every space that contains a combustion appliance and in one supply vent for combustion forced air furnaces. The test must be repeated if an appliance is serviced or replaced.

Flue Carbon Monoxide levels

Tests must be completed on the amount of Carbon Monoxide, in PPM, found in the undiluted flue gases of combustion appliances at steady state. An initial test must be performed on every combustion appliance. The test must be repeated if an appliance is serviced or replaced.

Combustion Air

Combustion air requirements, as prescribed in NFPA 54 or local gas codes, must be met on all homes with combustion appliances.

The Kbtu per hr input for heating and water heating equipment must be listed. If Kbtu per hr information is not available, state this fact and estimate input.

The location of all heating and water heating equipment must be listed.

The source and amount of combustion air for all heating and water heating equipment must be listed. For appliances that are using an interior space for combustion air, the cubic feet available is determined by the volume (area times height) of the space. Areas that can be isolated and the flow of air restricted from the combustion appliance are not to be included.

Heat Exchanger Safety Checks

Tests for possible cracked heat exchanger must be performed on all systems possible.

Draft Test

Test must be completed on the draft, measured in Pascal's, created in the flue during appliance operation. This test must be performed on atmospheric (appliances with a draft diverter) appliances. Appliance must draft within one minute of ignition. Do not drill sealed combustion or power exhaust appliances.

Spillage Test

Test must be performed on atmospheric (appliances with a draft diverter) appliances. Appliance must draft within one minute of ignition.

FINAL INSPECTION REQUIREMENTS

A final inspection shall be performed on all jobs.

The final inspection shall verify that the house characteristics reported are correct.

The inspection shall verify that all cost effective opportunities were completed.

The inspection shall include all measures listed on the Work Performed report to verify installation has been completed in a safe and effective manor.

The inspection shall include a review of the diagnostic result, both pressure and combustion safety, to verify that all applicable tests were completed. The inspector should complete diagnostics on a sampling of homes to compare with reported results.

HVAC EQUIPMENT AND DISTRIBUTION INSTALLATION/REPAIR POLICY

The following policy must be strictly adhered to when installing or repairing HVAC equipment and distribution systems.

Repair/Replacement

In determining if non-functional equipment will be repaired or replaced, the following factors are to be considered.

- Cost of repair
- Incremental cost of replacement
- Present value of savings resulting from new equipment
- Projected life of repaired equipment

If the present value of savings resulting from the new equipment is greater then the incremental cost of replacement, the equipment can be replaced. If the present value of savings resulting from the new equipment is less then the incremental cost of replacement, the equipment should be repaired.

Replacement of the equipment is also justified if there is a high probability that the repaired equipment will fail again in the near term.

Sizing & Installing HVAC Equipment

- Minimum HVAC efficiencies:
  - AC: 13 SEER
  - Heat Pump: 13 SEER and 7.7 HSPF
  - Combustion furnace: 80% AFUE.
- New mechanical systems shall be sized according to the ACCA Manual J. Room-by-room load calculations using the ACCA Manual J shall be submitted for each plan to verify sizing.
- Airflow across the indoor coil and/or heat exchanger shall conform to the manufacturer's specifications.
- Refrigerant charge shall be installed per the manufacturer's specifications.
- Indoor and outdoor units shall be "matched" according to the ARI Directory.

Evaporative Cooler Installation

It is strictly prohibited to install a new evaporative cooler on the ductwork of a forced air heating or cooling system.

All existing evaporative coolers must be equipped with a damper system that allows the cooler to be isolated from forced air ductwork or the conditioned space.

Installation of Forced Air Distribution Systems

- All new ductwork must be installed according to the Duct Installation/Repair Techniques and Product Guidelines.
- All duct systems must be pressure tested and the CFM leakage rate cannot exceed 3% of conditioned sqft or 5% of high speed fan flow of the systems air handler capacity.
- Airflow to each room shall match designed airflow calculations from the ACCA Manual J to within +/- 10%.

Repair of Existing Air Distribution Systems

All ductwork must be repaired according to the Duct Installation/Repair Techniques and Product Guidelines.

Duct Installation/Repair Techniques

A. Flex ducts

- Seal the start collar to the plenum using mastic reinforced with mesh around the entire circumference.
- At all connections (triangles, junction boxes, etc.), fasten the inner liner to the start collar using a mechanically tightened draw band for mechanical strength.
- Seal the inner liner using approved mastic reinforced with fiberglass mesh and overlaid with another layer of mastic sufficient to cover the entire pattern in the mesh.
- Fasten the outer liner well over the start collar using a mechanically tightened draw band.
- Seal all boots to the Sheetrock using mastic or silicone caulk applied at the point where the air barrier (metal or exterior foil backing) meets the Sheetrock.

B. Duct board

- Staple all duct board joints with appropriate staples every two inches.
- Apply a layer of mastic; embed reinforcing mesh and overcoat with another layer of mastic sufficiently thick to hide the pattern in the tape.
- Allow for proper curing (manufacturer's specifications) before starting the system. This is critical.
- Seal all boots to the Sheetrock at the point where the foil backing meets the Sheetrock.

C. Metal

- Seal all points where components join together using mastic. Special attention must be given to any area where tabs provide the method of securing the joint.
- Seal all boots to the Sheetrock at the point where the metal meets the Sheetrock.
- Join all components with screws or other mechanical fastening devices as required in listings or code.

D. Building Cavities Used as Returns

- If the cavity is lined with Sheetrock, seal all joints with mastic. All gaps over 1/4 inch must be reinforced with embedded mesh tape.
- If the cavity is lined with duct board with the fiberglass side facing inside, you must create a positive air barrier in the plenum by covering the fiberglass with a material such as Sheetrock, duct board with the foil facing inside, or coat the fiberglass with mastic, etc., and seal all remaining joints in the plenum.
- If the cavity is unlined (exposed studs) and it is impossible to line the plenum, seal all joints, holes and penetrations using mastic applied with a brush attached to a handle or other extension. It may be easier and more effective to simply create a ducted plenum or chase and avoid the problems associated with using a building cavity to convey conditioned air.
- It may be necessary to cut a hole in the plenum in order to gain access and seal the interior adequately.

E. Air Handler

- Seal all penetrations and gaps between materials using mastic or silicone. If the gap is over ¼ inch, reinforce with fiberglass mesh.
- Seal the areas where the air handler meets the supply/return plenums using mastic reinforced with fiberglass mesh or other approved methods.
- Seal any panels that will require frequent access by the client (such as the filter area), using a quality temporary tape (duct tape).
- The air handler must not have any noticeable leaks.

F. Wall Penetrations

(The most common wall penetration problem is where the opening for the return grille is cut through the wall. In such an installation, even in a lined plenum, the wall cavity is open into the plenum.)

- Where an un-ducted section of the air distribution system penetrates a wall cavity, the wall cavity must be sealed.
- The cavity will first be blocked using a rigid air barrier such as Sheetrock or duct board with the foil facing the airflow.
- All seams, cracks, crevices, and openings will then be sealed airtight using approved mastic.

PRODUCT GUIDELINES

- All new ductwork will be a minimum of R-6.
- Duct sealing materials shall have both excellent cohesive and adhesive qualities.
- Water-based Latex mastic with at least 50 percent solids reinforced with fiberglass mesh at all duct connections, joints and seams shall be used. "Hardcast" type mastic with reinforcing mesh is also acceptable.
- The ducts shall be further attached as per manufacturer's specification, using a draw tie, plumbing strap or screws, as appropriate for a strong mechanical connection. The mechanical connection **does not** replace air sealing.
- Foil tapes, including UL 181 AP-type tapes, when used alone will not be accepted. If tape is used to temporarily hold a seam, it must be overlaid with a coating of mastic that extends at least one inch (1") past the tape on all sides, and is thick enough to hide the tape completely.
- Do not use materials that are potentially damaging or have harmful effects, such as toxic vapors or carcinogenic substances that may be harmful to the clients or the installer. Agencies are required to obtain and maintain the Material Safety Data Sheets (MSDS) for all materials used on the job. Federal law requires this procedure; further information is available locally from the vendor.
- Materials must meet all current codes and manufacturer's specifications.

Low Income Weatherization Program

HEALTH AND SAFETY PLAN

PURPOSE

To establish the policies and procedures under which health and safety concerns are addressed in the Weatherization Assistance Program (WAP).

GOAL

To ensure energy savings are the result of Weatherization Assistance Program actions while promoting a healthy and safe environment for clients and WAP workers and contractors.

SCOPE

Energy-related health and safety concerns need to be remedied before, or because of, the installation of weatherization materials. Therefore, energy-related health and safety hazards associated with weatherization activities may be remedied or prevented with DOE funds. Measures and their costs must be reasonable and must not seriously impair the primary energy conservation purpose of the program.

The Health and Safety Procedures are applicable to all activities under the WAP.

A. Grantee Health & Safety

The Arizona Energy Office – WAP field monitors will follow all applicable health and safety rules with respect to the conduct of their on-site job visits including the use of face masks, hard hats, appropriate footwear, and such other applicable attire and equipment so as to minimize personal risks.

B. Crew and/or Contractor Health & Safety

Arizona Sub grantees and their contractors will comply with Occupational Safety and Health Administration (OSHA) requirements in all weatherization activities.

The costs for Sub grantees to comply with OSHA requirements (action items & measures that DOE funds and receives credit for) may be charged under health and safety, tools and equipment, incidental repairs, etc. The cost category selected will be charged consistently throughout the state (from agency to agency) for the same activity.

Because of the wide range of activities involved in weatherizing a house, ensuring crew health and safety requires a broad knowledge of the appropriate OSHA requirements. Some of these requirements include, but are not limited to: respirator protection, techniques for safely lifting heavy objects, electrical equipment safety, ladder safety, and general worker protection. OSHA standards should be consulted for further details.

Other useful information includes Material Safety Data Sheets (MSDS) that identify potential health risks and describe the proper use, handling, and storage of a wide variety of materials, including some common weatherization materials. MSDS also recommend personal protective equipment and address first aid measures.

C. Client Health and Safety

Weatherization services can be provided in a manner that minimizes risk to workers and clients. Although the Weatherization Assistance Program does not provide all the solutions, awareness of potential hazards is essential to providing quality services. A list of the more common hazards and DOE's preferred approach to them are discussed in Section D. Other energy-related hazards should be considered on a case-by-case basis

Grantees and subgrantees are required to take all reasonable precautions against performing work on homes that will subject workers or clients to health and safety risks. If there is any doubt that weatherization work can be conducted in a manner that is safe for all parties concerned, the Subgrantee must not proceed further.

Before beginning work on the residence, Subgrantees will take into consideration the health concerns of each occupant, the condition of the dwelling, and the possible effect of work to be performed on any particular health or medical condition of the occupants. When a person's health is fragile and/or the work activities would constitute a health or safety hazard, the occupants at risk will be required to leave the home during these work activities or the work will be suspended until such a time as it can be performed appropriately.

D. Potential Hazard Considerations

1. Biologicals

Removal of mold, odors, viruses, bacteria, unsanitary (including raw sewage) conditions, and rotting wood is not a Weatherization responsibility; however, Subgrantees frequently encounter these conditions. DOE funds may be used if these conditions must be remedied to allow effective weatherization work and/or to assure the immediate or future health of workers and clients. The Arizona Energy Office – WAP requires that its Subgrantees seek prior approval to proceed before attempting to weatherize such dwellings with *Biological* problems.

Arizona Subgrantees will exercise caution when selecting air tightness limits for dwellings with these problems. Since these conditions are often related to moisture, Arizona subgrantees may use DOE health & safety funding to acquire moisture detection instruments. Subgrantees should incorporate moisture detection into their initial energy audits. If necessary, weatherization services may need to be delayed until moisture problems can be corrected by other funding sources.

2. Combustion Appliances and Combustion Gases

The following policy must be strictly adhered to when completing Weatherization work. If any house fails these program safety standards and the problem cannot be remedied, the homeowner must be notified in writing and a copy placed in the client's file.

- Perform air sealing and duct repair **only** in conjunction with pressure diagnostics to ensure that sufficient ventilation and draft rates are maintained in the home.
- A UL listed carbon monoxide detector (Underwriters Laboratories 2034-98) shall be installed in all structures with an attached garage or a combustion appliance located in the conditioned space.
- Research and follow the local health and safety codes and standards dealing with residential ventilation requirements for occupants and combustion equipment.
- No air sealing (including duct repair) should be done if there is a high pollution source, such as a non-vent combustion heater, that can't be removed.
- No air sealing (including duct repair) should be done if there are existing health and safety problems in the home.
- No air sealing (including duct repair) should be done if there is Carbon Monoxide (CO) present in the flue gases higher than 100 PPM.
- No air sealing (including duct repair) should be done if there is a possible gas leak.
- No air sealing (including duct repair) should be done if CO is greater than 9 PPM in the living space.
- If CFM50 is less than 1500 CFM for the home or 300 CFM per person (whichever is greater), the homeowner must be advised of the tightness of the home. Any further air sealing (including duct repair) may require that an active ventilation strategy be employed.
- Under normal operating conditions, an air handler cannot create room pressures with a magnitude of - 3.0 Pascals, or greater with reference to outside, anywhere in a combustion appliance zone.
- Corrective action must be completed before or in conjunction with air sealing (including duct repair) if a negative pressure of 3 pascals or greater exists or is produced by repair work in a combustion appliance zone.

- Flame change is an indication of a cracked heat exchanger - no air sealing (including duct repair) should be done until the problem is fixed.

- If spillage of flue gases occurs for more than one minute - no air sealing (including duct repair) should be done until the problem is fixed.

- If draft is low, it must be fixed before air sealing (including duct repair) is completed.

  Minimum draft pressures required as follows:

  Outside temperature below 20° F, -5.0 pascals draft
  Outside temperature 20° to 40° F, -4.0 pascals draft
  Outside temperature 40° F to 60° F, -3.0 pascals draft
  Outside temperature 60° F to 80° F, -2.0 pascals draft
  Outside temperature above 80° F, -1.0 pascals draft

IF THE CONDITIONS DESCRIBED BELOW CONCERNING COMBUSTION AIR ARE NOT MET, NO AIR SEALING (INCLUDING DUCT REPAIR) SHOULD BE DONE:

- In homes of ordinary tightness insofar as infiltration is concerned, all or a portion of the air for fuel-burning appliances may be obtained from infiltration when the requirements for 50 cubic feet per 1000 Btu/hr input is met. Two openings are required and one shall be within 12 inches of the bottom of the space containing the combustion equipment. Openings shall allow space to communicate with the rest of the house. A minimum free area of one square inch per 1000 Btu per hour (or 100 square inches, which ever is greater) of the total input rating of all gas utilization equipment in the space, shall be provided.

- In all cases where combustion air is from inside the home, the homeowner must be made aware of this and sign the Health and Safety Waiver before any air sealing or duct repair is completed.
  (**Note:** If this method is used, special attention must be given to zonal and draft pressures. In buildings of unusually tight construction, combustion air shall be obtained from outside.)

- In homes that receive combustion air from outside the conditioned space, two openings are required. One shall be within 12 inches of the top and one within 12 inches of the bottom of the space containing the combustion equipment. The openings shall communicate directly, or by ducts, with the outdoors or spaces (crawl or attic) that communicate with the outdoors.

- The following guidelines must be met when determining the minimum free area for combustion air openings:

  - Openings directly communicating with the outdoors shall provide one square inch per 4000 Btu per hour of the total input of all gas utilization equipment in the space.

  - Openings communicating to outdoors with vertical ducts shall provide one square inch per 4000 Btu per hour of the total input of all gas utilization equipment in the space.

  - Opening communicating to outdoors with horizontal ducts shall provide one square inch per 2000 Btu per hour of the total input of all gas utilization equipment in the space.

(**NOTE:** If the free area is not known because of louvers or screens, double the required opening size. **IF THESE NFPA 54 NATIONAL FUEL GAS CODE REQUIREMENTS ON COMBUSTION AIR ARE NOT MET,** THEN NO AIR SEALING (INCLUDING DUCT REPAIR) SHOULD BE DONE UNTIL THESE CONDITIONS ARE MET.)

3. Fire Hazards

Combustion appliances and their associated venting systems can also present potential fire hazards. Subgrantees that accept clients with wood stoves and fireplaces will have procedures to identify potentially dangerous creosote build-up in chimneys and wood stove flues.

It is the Subgrantee's responsibility to ensure that any work on wood stoves and fireplaces conforms with applicable codes in jurisdictions where the work is being performed.

4. Existing Occupant Health Problems

Subgrantees will be sensitive to client health problems that might be exacerbated by weatherization activities.

Subgrantees will establish procedures to identify pre-existing client conditions (e.g., allergies) and address such problems when they are found. Those procedures should address the manner in which such problems will be identified and the steps to be taken to ensure that weatherization work will not worsen these problems.

5. Indoor Air Quality (IAQ)

a. Asbestos

General asbestos removal is not approved as a DOE WAP health and safety weatherization cost.

Major asbestos problems should be referred to the Arizona Department of Environmental Quality or to the Environmental Protection Agency (EPA).

Where local agencies work on large heating and distribution systems, including related piping, asbestos removal may be necessary. Removal is allowed to the extent that energy savings resulting from the measure will provide a cost-effective savings-to-investment ratio. This would normally be true with work done on large, multifamily heating systems. Where permitted by code or EPA regulations, less costly measures that fall short of asbestos removal, such as encapsulation, may be used. Removal and replacement of asbestos siding for purposes of wall cavity insulation is permissible if allowed by state and local codes.

b. Radon

Where there is a previously identified radon problem, work that would exacerbate this problem should be limited. Radon abatement is not an allowable activity under the Weatherization program. However, those costs associated with taking precautions in a dwelling known to have radon problems are allowable weatherization expenditures. These costs are allowable if an energy audit indicates that weatherization techniques would help in radon remediation. While Subgrantees should establish sound radon-related strategies, major radon problems should be referred to the appropriate local environmental organization or agency for mitigation or abatement.

c. Formaldehyde and Volatile Organic Compounds (VOCs)

Formaldehyde vapors may be slowly released by some new carpets, wafer-board,
plywood, etc. Some household cleaning agents also emits VOCs.
Caution should be taken when selecting air tightness limits in dwellings with VOC problems.

6. Lead Paint

In May 2001, the Weatherization Assistance Program (WAP) issued Program Notice 01-10, Weatherization Activities and Federal Lead-Based Paint Regulations. This document and its attachments lay out the requirements for Arizona's sub-grantees and their contractors to follow when working in homes with lead-based paint.

Lead-based paint dust and other residues are hazards that Weatherization workers are likely to encounter in older homes. HUD estimates that four million homes have significant lead-based paint hazards. Furthermore, some Weatherization work (working with older wood sash windows) may directly disturb lead-based paint, possibly creating hazardous conditions. Arizona's WAP policy is that Weatherization workers must be aware of the hazard and conduct Weatherization activities in a safe work manner to avoid contaminating homes with lead-based paint dust and debris, and to avoid exposing the occupants, themselves and their families to this hazard. The protocols used to safe guard people from lead-based paint hazards are called Lead Safe Weatherization (LSW).

ARIZONA'S LEAD SAFE WEATHERIZATION PROTOCOLS

LSW is a set of protocols to be used when disturbing surfaces that may have lead-based paint, that will reduce and control the amount of lead dust and paint chips that are generated. Arizona has adopted the protocols developed by the Montana State University. These protocols are attached or the curriculum is available for review on the WAPTAC website **www.waptac.org.**

When is LSW necessary.

Local sub-grantees will use the following set of criteria for determining when LSW would be performed:

- The dwelling was constructed pre-1978, and
- The dwelling has not been determined to be lead-based paint free, and
- Either, the amount of disturbed lead-based painted surface exceeds two square feet per room of interior surface, twenty square feet of exterior surface, or 10 percent of a small component type, e.g., window; or the amount of lead-based paint dust that will be generated by the Weatherization work exceeds the OSHA-defined airborne levels for lead.

Testing for lead-based paint and lead-based paint residues.

Testing for lead-based paint is not an allowable weatherization expense except, when it is related to the installation of energy efficiency measures. These expenditures must be within the limits set by the state in its Weatherization health and safety plan.

In pre-1978 houses where the presence or absence of lead-based paint has not been determined, testing for lead-based paint could be worthwhile as an economy step. If the anticipated weatherization/energy efficiency work involves disturbing more than a small amount of painted surfaces, then ruling out the presence of lead in the paint would save extra time and costs associated with doing LSW practices. Testing in a home for lead in a painted surface, when it is done, is limited to only those surfaces that will be disturbed.

The following considerations are offered as a guide to determining whether testing is worth the time and money on a case-by-case basis:

- Houses (including mobile homes, and apartments) built from 1978 on may be assumed to be free of lead-based paint, without testing.
- In houses (including mobile homes, and apartments) built prior to 1930, it is logical to simply assume the presence of lead-based paint and save the cost of testing.
- In homes built between 1930 and 1978, testing may not be warranted if the amount of paint to be disturbed is small, since it may be cheaper to perform LSW for a small area than to incur the expense of testing. However, where the amount of paint to be disturbed is relatively large, it may be worth the cost of testing, since a negative result would mean that the crews could dispense with having to perform the LSW protocols.

Routine testing of every house for lead paint levels before the start of work (testing of painted surfaces to be disturbed and/or risk assessment) and at the end (clearance testing) is a standard practice associated with lead paint hazard control or abatement work and is not an allowable use of DOE Weatherization funds, except as required when weatherization work is being done on HUD homes or with HUD funds. If a sub-grantee establishes a regimen of routine risk assessment and clearance testing for all cases where the presence of lead paint is a possibility, the sub-grantee must use other sources of funding to implement such a policy.

NOTE: **HUD's guidance to its properties has been to test all properties for the presence of lead-based paint; so, the HUD program housing in your area may already have been tested for lead-based paint.**

About Clearance Testing - Clearance testing (as required by the HUD Rule) is not a requirement for Weatherization work per se. **As such, clearance testing is not an allowable expenditure of DOE funds.**

However, under some circumstances, clearance testing may be required if you are doing Weatherization work in HUD program housing or you are using HUD funds. In these instances, your first course of action should be to ask the HUD program to fund the additional cost for LSW and clearance testing. If no HUD funds are available, DOE funds may be used for clearance testing since it is a requirement in this instance.

Arizona subgrantees must seek prior approval in every instance before DOE WAP funds will be approved for clearance testing in allowable *special situations* involving HUD housing.

Deferrals

Arizona's WAP sub-grantees will follow the lead-based paint "deferral policy" to determine when it is prudent to defer certain Weatherization work in homes that have either tested positive or are assumed to have lead-based painted surfaces.

- First, the subgrantee should assess the following factors:

  1) Is the subgrantee prepared to work with lead-based paint? (i.e., have workers received training in LSW work practices - is the necessary equipment, such as HEPA vacuum cleaners, available; and does the agency's liability insurance cover work with lead-based paint);

  2) What is the condition of the painted surfaces in the house that might be specifically disturbed in the course of an allowable weatherization measure? (i.e., are they *seriously* deteriorated);

  3) What is the extent to which the specific energy efficiency measures determined by the audit will disturb painted surfaces? (i.e., will the disturbance likely generate dust in excess of OSHA minimums); and,

  4) Will the cost of doing LSW work represent a large portion of the total cost, such as to exceed the amount allowed by the state's health and safety plan (which could be the case if large amounts of lead-based paint surfaces will be disturbed)?

- Second, the grantee should determine, based on consideration of the above factors, whether to:

  1) proceed with all the weatherization work, following LSW work practices; or
  2) Do some of the weatherization tasks, defer others; or
  3) Defer all the weatherization work

  Deferral would mean postponing the work either until the Weatherization agency is prepared to work with lead-based paint, or until another funding source has been identified that can finance corrections to the problem LPB area that weatherization can be safely performed.

  In cases where extensive LSW would be necessary, agencies are encouraged to arrange with other organizations, which are funded to do lead-based paint hazard control, to perform some of the more costly activities, such as risk assessment or clearance testing.

  In areas where there are no organizations performing such work, Weatherization agencies may choose to develop their capabilities (purchase of equipment and advanced training for subgrantee crews) for lead-based paint hazard control work, but they may not use DOE Weatherization funds for this purpose. In such a home, regular Weatherization work that does not disturb painted surfaces can be done.

Funding of lead safe weatherization

Whereas DOE funds may be used to pay for Weatherization activities that disturb lead-based painted surfaces while installing energy efficiency measures or for case-by-case testing, the funds may not otherwise be used for abatement, stabilization or control of lead-based paint hazards, or routine entrance and clearance testing.

However, U. S. Department of Housing and Urban Development (HUD) funds such as Community Development Block Grant (CDBG), lead hazard control programs and HOME Repair and Rehabilitation Program funds may be used to do this work. Also, U. S. Department of Health and Human Services' (HHS) Low-Income Home Energy Assistance Program (LIHEAP), may be used for certain expenses related to Lead Safe Weatherization.

Specifically, for DOE funding, agencies should budget LSW costs under health and safety as a separate cost category, excluded from the calculation of average cost per home. Lead Safe Weatherization costs include labor, material, insurance, training, and equipment.

Liability issues

Unless an agency has specifically purchased additional insurance to cover pollution occurrences, they probably do not have sufficient insurance for their work as required by the WAP's Program Year 2002 Annual Guidance, **Weatherization Program Notice 02-1**. It is likely that their general liability insurance has a pollution occurrence exclusion.

All Arizona Sub-grantees must have liability insurance that covers work in a home with lead-based paint before any LSW work is implemented. This liability insurance does not and should not cover lead abatement projects.

Abatement projects are extensive projects designed to permanently eliminate the lead-based paint hazard. Only work that HUD refers to as "interim controls" must be covered. It is important to use this policy to demonstrate to the insurer the limited nature of the paint disturbance and the precautions being taken to avoid liability. The cost of such insurance is an allowable DOE expense, and we urge agencies to seek ways to obtain the coverage at reasonable rates.

For insurance shopping purposes, there are features about Weatherization work that local agencies should use in making the case for the lower risk associated with the nature of Weatherization work, especially when compared to lead-based paint abatement and lead hazard control work:

- Weatherization is different from lead hazard control work and involves lesser levels of work associated with painted surfaces. In fact, the disturbance of painted surfaces, by comparison, is minimal and when it happens, is incidental to the purpose of the work - the installation of energy conserving measures.

- In addition, not all weatherization work involves disturbing painted surfaces and some homes are lead free, and so the *risk basis* for insurance rates - unlike insurance for lead hazard control work - should not be based on one hundred percent operations in a lead paint environment for every home weatherized.

DOE is involved with EPA and HUD in continuing discussions with the insurance industry about ways to qualify Weatherization agencies for more favorable rates. We also welcome suggestions from state and local agencies with experience in obtaining reasonable rates for this kind of work, which we will share with the Arizona subgrantees.

Training

Arizona's WAP requires that *when disturbance of painted surfaces is significant*, Weatherization workers will use LSW practices.

Arizona's WAP will provide or recognize prior participation in the following training opportunities to sub-grantee as required, taking into consideration each subgrantees mix of action items and allowable measures:

- LSW workshops provided by trainers who are certified in The HUD Lead Safe Work Practices.
- Peer-to-Peer training.
- Individual agency training on an as needed basis.

All training will utilize the Lead Safe Weatherization curriculum developed by Montana State University.

7. Building Structure

Building rehabilitation is beyond the scope of the Weatherization Assistance Program; however, Arizona Subgrantees frequently encounter homes in poor structural condition. Dwellings whose structural integrity is in question should be referred to the Arizona Department of Housing.

Weatherization services may need to be delayed until the dwelling can be made safe for crews and occupants (see Deferral Standards).

Incidental repairs necessary for the effective performance or preservation of weatherization materials are allowed if the cost of the weatherization material and incidental repair are cost justified by the audit. Examples of these limited repairs include sealing minor roof leaks to preserve new attic insulation and repairing water-damaged flooring as part of replacing a water heater.

8. Electrical Issues

The two primary energy-related health and safety electrical concerns are 1) insulating homes that contain knob-and-tube wiring and 2) identifying overloaded electrical circuits.

Older electric wiring, primarily knob-and-tube wiring, located in a wall cavity or exposed on an attic floor was originally intended by code to have *free air movement* for that would cool the wire when carrying an electric current. Laboratory tests have shown that retrofitting thermal insulation around electric wiring can cause it to overheat, resulting in a fire hazard.

Arizona program policy requires that Subgrantees ensure that insulation around knob-and-tube wiring conforms with applicable codes in jurisdictions where the work is being performed.

Serious electrical hazards exist when gross overloads are present. Should auditors and crews find such existing problems, they must notify the owner verbally and in writing by the Subgrantee WAP program manager.

Weatherization measures that involve the installation of new equipment such as air conditioners, heat pumps, or electric water heaters can exacerbate previously marginal overload problems to hazardous levels. The problem must also be noted in the client file. To the extent that these problems prevent adequate weatherization, the agency should consider repairing them on a case-by-case basis.

9. Refrigerant Issues

The replacement of air conditioners requires Subgrantees to ensured that the requirements of the Clean Air Act 1990, section 608, as amended by 40 CFR 82, 5/14/93, be enforced. The appliance vendor, de-manufacturing center, or other entity recovering the refrigerant must possess EPA-approved section 608 type I or universal certification. Subgratnees must ensure they have appropriate protocols in place that comply with all standards relating to the disposal of the existing appliances.

10. Other Code Compliance Issues

It is the Subgrantee's responsibility to ensure that weatherization-related work conforms with applicable codes in jurisdictions where the work is being performed.

E. Deferral Standards

The decision to defer work in a dwelling is difficult, but necessary, in some cases. This does not mean that assistance will never be available, but that work must be postponed until the problems can be resolved and/or alternative sources of help are found. Note that subgrantees, including crews and contractors, are expected to pursue reasonable options on behalf of the client, including referrals, and to use good judgment in dealing with difficult situations.

Subgrantees will develop guidelines and a standardized form for such situations. The form will include the client's name and address, dates of the audit/assessment and when the client was informed, a clear description of the problem, conditions under which weatherization could continue, the responsibility of all parties involved, and the client(s) signature(s) indicating that they understand and have been informed of their rights and options.

Deferral conditions may include:

- The client has known health conditions that prohibit the installation of insulation and other weatherization materials.

- The building structure or its mechanical systems, including electrical and plumbing, are in such a state of disrepair that failure is imminent and the conditions cannot be resolved cost-effectively.

- The house has sewage or other sanitary problems that would further endanger the client and weatherization installers if weatherization work were performed.
- The house has been condemned or electrical, heating, plumbing, or other equipment has been "red tagged" by local or state building officials or utilities.
- Moisture problems are so severe they cannot be resolved under existing health and safety measures and with minor repairs.
- Dangerous conditions exist due to high carbon monoxide levels in combustion appliances, and cannot be resolved under existing health and safety measures.
- The client is uncooperative, abusive, or threatening to the crew, subcontractors, auditors, inspectors, or others who must work on or visit the house.
- The extent and condition of lead-based paint in the house would potentially create further health and safety hazards.
- In the judgment of the energy auditor, any condition exists which may endanger the health and/or safety of the work crew or subcontractor, the work should not proceed until the condition is corrected.

REFRIGERATOR REPLACEMENT POLICY

The following criterion apply to replacement refrigerators:

ELIGIBILITY FOR REPLACEMENT

Weatherization Program Notice 00-5 lists the types of refrigerators that may be installed with U.S. Department of Energy (DOE) funds. Refrigerators and refrigerator-freezers with manual, automatic, or partial automatic defrost are eligible. Units must comply with UL-250 and with energy efficiency standards established in the National Appliance Energy Conservation Act of 1987 that are periodically updated. New replacement units may **not** have through-the-door ice or water service since this feature increases energy use.

To qualify for replacement, the refrigerator replacement unit must result in a savings-to-investment ratio (SIR) of 1.0 or greater.

To determine the SIR, one of the following methods must be used to determine the energy use of the existing unit:

- Refrigerator replacement analysis tools that utilize the Association of Home Appliance Manufacturers or other approved refrigerator databases.
- Meter electric usage of the existing unit utilizing an approved meter. A list of approved meters is available from the Arizona Energy Office.

METERING REQUIREMENTS

- Meter at least 10% of units replaced — It is not required to meter every existing refrigerator that is replaced. Initially, as the program gains experience, DOE will require metering on at least 10% of the units replaced. Units that cannot be located in the Association of Home Appliance Manufacturers, or other refrigerator databases, may make up all or most of the 10% requirement.
- Meter at least 2 hours — The minimum metering duration required to obtain results accurate enough to make a reliable replacement decision has been debated for several years. DOE believes a two-hour minimum metering duration is an appropriate compromise.

MATERIALS

- New refrigerators shall:
  - Not exceed the size as the replaced unit.

- Not exceed 18 cubic feet in size.
- Have a minimum 1-year warranty.

INSTALLATION

- The electrical outlet shall:
  - Provide the voltage specified on the ID plate of the new refrigerator.
  - Be properly grounded and/or protected with a properly functioning GFIC device.
  - Be located within reach of the refrigerator without the use of an extension cord.
  - Be in good condition with nothing visibly wrong (e.g., not cracked or broken, and no spark, smoke, or burn marks, etc.).
  - Meet refrigerator manufacturer's specifications for space and clearances.

- The contractor shall:
  - Deliver and install the new refrigerator.
  - Level the unit to ensure proper operation.
  - Ensure that door hinges are on the appropriate side.
  - Instruct the customer on refrigerator operation.
  - Deliver warranties and operating manuals to the customer.
  - Set temperature controls appropriately.

DISPOSAL

- The contractor shall:
  - Take unit out of service. Make sure the existing refrigerator, removed from the house, does not find its way back onto the electric grid.
  - Dispose of unit in an environmentally responsible manner. All refrigerators replaced must be properly disposed of according to the environmental standards in the Clean Air Act of 1990, section 608, as amended by Final Rule 40 CFR 82, May 14, 1993.
  - Take unit to a de-manufacturing facility or incorporate disposal requirements in vendor contract.
  - Remove all packing materials from the customer's premises.

REPORTING

- The sub-grantee shall record the following information for both the existing and replacement refrigerators on the Household Reporting Form:
  - Manufacturer (for years available).
  - Brand.
  - Year of manufacture.
  - Model number.
  - Type (e.g., side-by-side, top freezer).
  - Database estimated kWh/yr.

- On metered units, the sub-grantee shall provide an estimated annual kWh usage and the duration of metered data.
- Provide saving to Investment Ratio for the replacement refrigerator.

WAIVERS

There may be cases were it is the best interest of the client that a refrigerator be installed that does not meet the requirements of the Weatherization Assistance Program Refrigerator Replacement Policy. In these cases, the Weatherization Assistance Program Waiver Process must be followed.

Appendix 2: 150 House Study by AEO

Present Value Analysis
SWG Low-Income Weatherization Program
July 1, 1999 to June 31, 2000

The total amount of Southwest Gas Low Income funds spend in the fiscal 99/00 program year was $166,218.58 (WACOG June report still not in). $123,295 was spent of measures that are included in the analysis. $42,923 was spent on health and safety and other repairs. $22,069 was spent on administration. Total present value for funds spent was $536,422. Saving to investment ration for Southwest Gas (SWG) funds spent on measures is 3.22.

Below is a summary of how these figures were derived.

Average cost per measure:
The Southwest Gas Low-Income funds are used in conjunction with a number of other funding sources. This results in multiple funding sources being used in a high percentage of installed measures. This requires that an average costs per unit to complete a weatherization measure be determined, allowing these values to be applied to the (SWG) funds spent on each measure. The following is a list of these average program costs for measures that used SWG funds.

Duct repair:
Air Conditioned homes: 0.83 CFM50 per dollar.
Evaporative cooling: 2 CFM50 per dollar.

Infiltration (air sealing and pressure balancing):
Air Conditioned homes: 1.5 CFM50 per dollar.
Evaporative cooling: 3.6 CFM50 per dollar.
Pressure balancing: Approximately 3 Pascals average per home.

Attic insulation:
Air Conditioned homes: Average existing insulation level of R-7, increasing to R-30 for $.30 per square foot.
Evaporative cooling: Average existing insulation level of R-2, increasing to R-19 for $.25 per square foot.

Shade screens:
$3 per square foot

HVAC equipment replacement:
AC/heating: 11.5 SEER AC and an 80% AFUE gas furnace (gas pack) average cost of $2400.
Heating only: 80% AFUE gas furnace average cost of $1300.

Present value analysis

The next step was to determine present value for each of the measures listed above. The present value analysis presented used a discount rate of 3.7%. Life of measure used in present value analysis is listed with each measure.

Duct sealing: The following values were derived by utilizing the results from the APS study on duct leakage performed by Proctor Engineering. The saving values used are very conservative and could be as much as two times the value listed because of the interaction between duct leakage, house pressures, infiltration and system efficiency. Measure life of 20 years

Low Income Weatherization Program

Climate zone	AC/Forced air heating	Evap cooling/Forced air heating
II (Phoenix)	$5.15 per CFM50 reduction	$.65 per CFM50 reduction
III (Prescott)	$3.3 per CFM50 reduction	$2.50 per CFM 50 reduction
IV (Tucson)	$3.70 per CFM50 reduction	$.70 per CFM50 reduction
VI (Yuma)	$9.00 per CFM50 reduction	$.35 per CFM50 reduction

Infiltration: The following values were derived using REM/design Software. Measure life of 20 years

Climate zone	AC/Forced air heating	Evap/Forced air heating
II (Phoenix)	$.29 per CFM50 reduction	$.22 per CFM50 reduction
III (Prescott)	$.59 per CFM50 reduction	$.59 per CFM 50 reduction
IV (Tucson)	$.26 per CFM50 reduction	$.23 per CFM50 reduction
VI (Yuma)	$.50 per CFM50 reduction	$.14 per CFM50 reduction

Attic Insulation: The following values were derived using REM/design Software. Measure life of 20 years

Climate zone	AC/Forced air heating R-7 to R-30	Evap/Forced air heating R-2 to R-19
II (Phoenix)	$1.02 per square foot	$.23 per square foot
III (Prescott)	None completed	$.70per square foot
IV (Tucson)	$.85 per square foot	$.23 per square foot
VI (Yuma)	$.98 per square foot	$.20 per square foot

Shade Screens (AC only): The following values were derived using the REM/Design software. Measure life of 7 years

Climate zone	Shade Screens
II (Phoenix)	$13 per square foot
III (Prescott)	None completed
IV (Tucson)	None completed
VI (Yuma)	None completed

HVAC Equipment Replacement: The following values were derived using the REM/Design software. Measure life of 15 years

Climate zone	11.5 SEER 80% AFUE	80% AFUE
II (Phoenix)	$7685	$745
III (Prescott)	None completed	None completed
IV (Tucson)	None completed	$827
VI (Yuma)	None completed	None completed

Dollars per measure spent

By determining the total dollars spent per measure and applying it to the average cost of measure and present value amount, an estimate of the total present value for the SWG low-income program can be determined. To achieve this, the total dollar amount of SWG funds spent per measure is multiplies by the average cost to determine the total amount of the measures completed with SWG funds. The total amount of measure completed is multiplied by the unit present value of the measure to estimate the present value for each measure. ***note, infiltration saving for pressure relief not included**.

Climate zone II:

Measure	Dollars spent on measure	Units completed per dollar	Total units completed	Present value per unit	Present value for measure
Duct repair/AC	$24,618	.83 CFM50	20,433 CFM50	$5.15	$105,230
Duct repair/Evap	$24,326	2 CFM50	48,652 CFM50	$.65	$31,624
Infiltration/AC	$3,682	1.5 CFM50	5,523 CFM50	$.28	$1,602
Infiltration/Evap	$10,936	3.6 CFM50	39,370 CFM50	$.22	$8,661
Attic insulation/AC	$10,949	3.3 sq. ft.	36,132 sq. ft.	$1.02	$36,854
Attic insulation/Evap	$8,090	4 sq. ft.	32,360 sq. ft.	$.23	$7,443
Shade screens	$1,950	.333 per sq. ft.	649 sq. ft.	$13	$8,437
AC/Heating systems	$14,682	.00041 ($2,400 per system)	6	$7,685	$46,110
Heating systems	$7,667	.00077 ($1,300 per system)	5.9	$745	$4,396
Totals	$106,900				$250,357

Climate zone III:

Measure	Dollars spent on measure	Units completed per dollar	Total units completed	Present value per unit	Present value for measure
Duct repair/AC	None				
Duct repair/Evap	$586	2 CFM50	1,172 CFM50	$2.50	$2,930
Infiltration/AC	None				
Infiltration/Evap	None				
Attic insulation/AC	None				
Attic insulation/Evap	$302	4 sq. ft.	1,208 sq. ft.	$.70	$846
Shade screens	None				
AC/Heating systems	None				
Heating systems	None				
Totals	$888				$3,776

Climate zone IV:

Measure	Dollars spent on measure	Units completed per dollar	Total units completed	Present value per unit	Present value for measure
Duct repair/AC	$63	.83 CFM50	52 CFM50	$3.70	$192
Duct repair/Evap	$6,611	2 CFM50	13,222 CFM50	$.70	$9,255
Infiltration/AC	None				
Infiltration/Evap	$278	3.6 CFM50	1001CFM50	$.23	$230
Attic insulation/AC	$100	3.3 sq. ft.	330 sq. ft.	$.85	$281
Attic insulation/Evap	$2,990	4 sq. ft.	11,996 sq. ft.	$.23	$2,759
Shade screens	None				
AC/Heating systems	None				
Heating systems	$3,475	.00077 ($1,300 per system)	2.6	$827	$2,150
Totals	$13,517				$14,867

Climate zone VI:

Measure	Dollars spent on measure	Units completed per dollar	Total units completed	Present value per unit	Present value for measure
Duct repair/AC	$104	.83 CFM50	86 CFM50	$9.00	$774
Duct repair/Evap	None				
Infiltration/AC	$1,444	1.5 CFM50	2166 CFM50	$.50	$1,083
Infiltration/Evap	None				
Attic insulation/AC	$442	3.3 sq. ft.	1,459sq. ft.	$.98	$1,430
Attic insulation/Evap	None				
Shade screens	None				
AC/Heating systems	None				
Heating systems	None				
Totals	$1,990				$3,287

House of Refuge East

$20,000 of SWG funds were transferred from the Tucson Urban League to the city of Mesa for the House of Refuge East project. This project was analyzed individually because of the specific information available for the project. A total of 86 homes were completed. The homes have AC and gas forced air furnaces. Duct repair, shade screen and pre-set thermostats were installed.

Present Value Analysis:

Duct repair: Duct leakage reduction was measured at between 150 CFM50 and 200 CFM50 per home. For the analysis, 150CFM50 reduction was used as an average per home.
86 homes X 150 CFM50 = 12,900 CFM50 total duct leakage reduction for the project.
12,900 X $5.15 present value per CFM50 = $66,435 present value for duct repair.

Shade screens: Shade screens were added to all homes where needed. A total of 3,300 sq, ft. of screens were install for $10,000.
3,300 X $13 present value per sq. ft. of screen = $42,900 present value for shade screens.

Thermostats: All homes were equipped with a pre-set, non-adjustable thermostat at a total cost of $4,900. The set points of existing thermostats were recorded during this project with majority set below 75°. The new thermostats are pre-set at 68° for heating and 78° for cooling. For this analysis, original set points of 70° for heating and 76° for cooling was used.
Present value (10 year life) per home for a set back of 2° for heating and cooling equals $1,800.
86 X $1,800 = $154,800 present value of pre-set thermostats.

The total present value for the House of Refuge East project is $264,135.

Total Present Value

Climate zone II	$250,357
Climate zone III	$3,776
Climate zone IV	$14,867
Climate zone VI	$3,287
House of Refuge	$264,135
Total	$536,422

TERMS

CFM50: CFM50 is the airflow (in cubic feet per minute) from the Blower Door fan needed to create a change in building pressure of 50 Pascals (0.2 inches of water column). A 50 Pascal pressure is roughly equivalent to the pressure generated by a 20 mph wind blowing on the building from all directions. CFM50 is the most commonly used measure of building airtightness and gives a quick indication of the total air leakage in the building envelope.

CFM50 reduction: The reduction in the measured CFM50 airflow from a Blower Door test resulting from the completion of house or duct air sealing.

REM/Design Software: This user- friendly, yet sophisticated, software calculates heating, cooling, domestic hot water, lighting and appliance loads, consumption, and costs based on a description of the home's design and construction features as well as local climate and energy cost data. Additionally, **REM/*Design*™** is DOE-approved for Weatherization Assistance Programs in all states.

Low Income Weatherization Program

Appendix 3 – Benefit Cost Calculations

WAP Rules and Calculations for AEO (Zone III Evap - Zone IV Heating System)						Conversion for ACC Report		
Measure	**Dollars spent on measure**	**Units completed per dollar**	**Total units completed**	**Present value per unit**	**Present value for measure**	**Life**	**Discount Rate**	**Future Value**
Duct repair/AC	$63	.83 CFM50	52 CFM50	$3.70	$192	20	3.7%	($37)
Duct repair/Evap	$6,611	2 CFM50	13,222 CFM50	$0.70	$9,255	20	3.7%	($30)
Infiltration/AC	None							
Infiltration/Evap	$278	3.6 CFM50	1001CFM50	$0.23	$230	20	3.7%	($29)
Attic insulation/AC	$100	3.3 sq. ft.	330 sq. ft.	$0.85	$281	20	3.7%	($31)
Attic insulation/Evap	$2,990	4 sq. ft.	11,996 sq. ft.	$0.23	$2,759	20	3.7%	($29)
Shade screens	None							
AC/Heating systems	None							
Heating systems - With absence of AEO Data for Prescott, used Zone	$3,475	0.00077 ($1,300 per system)	2.6	$2,481	$6,451	15	3.7%	($4,298)

UNSG

ESTIMATE OF ADDITIONAL kWH SAVINGS		kWh Reduction	kW Reduction	Life
CFL Replacements	Three (3) 60 watt incandescent to three (3) 15 watt CFL w/15 watt lamp (4 hours/day)	197	0.14	7
Refrigerator Replacements	Admiral 1979 19 cf Single Door (1860 kWh/Yr for Year 1-7) or 2004 Baseline unit (479 kWh/Yr for Year 8-13) Replaced by 18 cf Single Door Energy Star (407 kWh/Yr)	1250	0.14	13

SUMMARY OF ESTIMATED SAVINGS FOR UNSG

Measure	**Future Value**	**% of Customers Receiving Measure**	**Fuel Savings (E or G)**	**Avg. Therm Cost or kWh Cost**	**Therm Savings/Year**	**kWh Savings/ Year**	**Non-Coincident kW Savings/Year**	**Coincident kW Savings/Year**
Duct repair/Evap	($34)	100%	G	$1.40	24			
Infiltration/Evap								
Attic insulation/AC								
Attic insulation/Evap	($30)	100%	G	$1.40	22			
AC/Heating systems								
Heating systems - See note above	($4,298)	10%	G	$1.40	307			
Install three 15 Watt CFL		100%	E	$0.09		197	0.135	0.014
Refrigerator Replacement		5%	E	$0.09		62	0.007	0.007
Totals					**353**	**260**	**0.14**	**0.02**

Residential New Construction Program, DSM Portfolio, Attachment 2

Residential New Construction Program

Table of Contents

- Builder and sub-contractor education and training;
- Educational and promotional materials for builders and new home buyers; and
- Builder incentives for meeting Energy Star Homes® performance standards, as shown in Table 1.

Table 1: Energy Smart Homes Program Prescriptive Incentives

UES Energy Smart Home Program Incentives	
Meets ESH and Energy Star Homes® performance standards including testing and inspection protocol.	$400 per home

Delivery Strategy and Administration

The Energy Smart Homes Program will be implemented by employing the services of a qualified implementation contractor (IC) sought through a competitive bidding process. The IC will provide program administration, marketing, planning, coordination of builder and contractor training and consumer education activities.

Key industry relationships will include: (1) EPA/DOE Energy Star Homes® for program branding and certification standards; (2) building Science trainers for training and education; (3) testing and inspection contractors approved by RESNET for third party performance verification and energy ratings; (4) the Arizona Energy Office for support in all areas; and (5) local code officials.

The implementation contractor and UNSG representatives will develop key trade ally relationships including: (1) builders; (2) energy experts able to provide design assistance and building energy simulation modeling; (3) HVAC Contractors for sizing, installation and start-up of HVAC systems; (4) framing Contractors for framing and blocking detail to enhance insulation performance; and (5) insulation Contractors for insulation installed according to specifications.

Program logic model is included in Appendix 4.

Marketing and Communications

The goal for marketing the ESH is to educate consumers on the benefits of Energy Star Home® performance standards and promote builders who provide Energy Star Home® products. Marketing is necessary to drive the consumers to homebuilders who adhere to these performance standards. As more consumers demand the product, more builders will choose to build to ESH standards. Higher participation by builders results in higher quality and more energy efficient homes being built in the UNSG service territory.

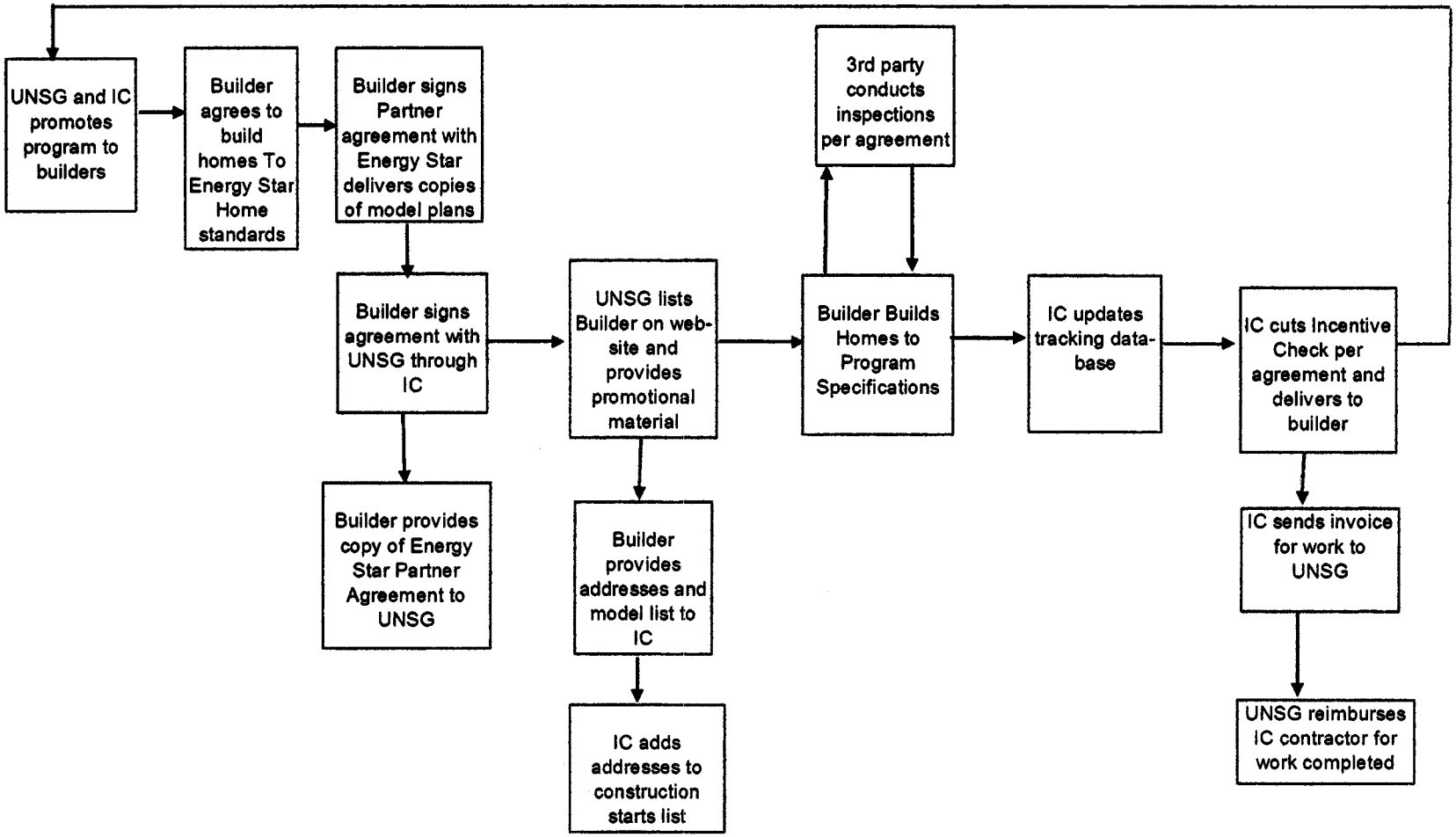
The IC and UNSG will provide the following marketing and promotional support:

For Builders:

- Advertisements and article placements in builder trade publications;
- Direct sales through builder account representatives;
- Point-of-Sale materials and sales tools;
- UNSG Web-site; and

UNSG Residential New Construction Program

Appendix 4 - Program Implementation Model



Efficient Home Heating Program, DSM Portfolio, Attachment 3

Efficient Home Heating Program

Program Objectives

The objective of the program is to promote the purchase of Energy Star qualified high-efficiency furnaces that meet or exceed the minimum Energy Star standard of 90% AFUE.

Products and Services

The products and services provided by the program include:

- Incentives to homeowners for the installation of qualifying high-efficiency furnaces. Incentives and qualifying criteria are summarized in Table 1.

Table 1. Incentives Schedule

Measure	Qualifying Criteria*	Average Incentive**
High Efficiency Furnaces	Minimum AFUE of 90%	$244
Packaged Air Conditioners with High-efficiency Furnaces	90 AFUE or better furnace with CEE Tier 1 or 2 AC rating	$254
* Consortium for Energy Efficiency ("CEE") is an independent rating agency. ** Incentives vary depending on unit heating capacity and efficiency. See appendix 3 for details on incentive levels		

- Marketing costs include compensation of $25 per unit paid to contractors to encourage program promotion and offset costs associated with detailed reporting required on each project.
- Education and promotional efforts designed to inform customers about the benefits of high-efficiency heating systems including educational brochures, program promotional material, and UNSG website content.

Delivery Strategy and Administration

The strategy for program delivery and administration is as follows:

- The Efficient Home Heating Program will be implemented jointly by a qualified implementation contractor (IC) selected through a competitive bidding process and an in-house Program Manager.
- UNSG will provide overall program management, planning and coordination of customer and contractor participation. The IC will verify equipment efficiency, process rebates, provide marketing, tracking and technical support and evaluation;
- Key partnering relationships will include:
  - Heating training professionals;
  - Heating contractors trained in program procedures; and
  - The Arizona Energy Office to provide training, education and awareness.

Program implementation flow chart is included in Appendix 1.

Appendix 1 – Efficient Home Heating Program Implementation Plan

UNSG Residential HVAC Retrofit Program

Appendix 1 - Program Implementation Model

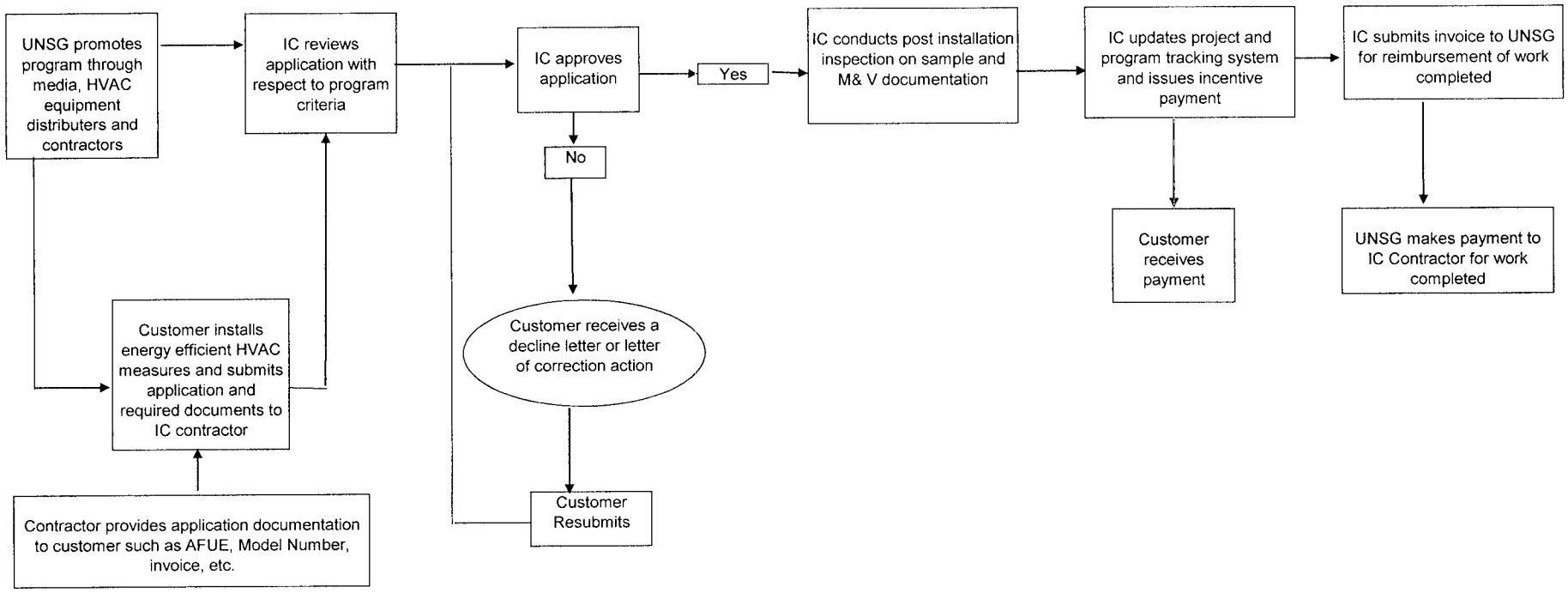


EXHIBIT 1

Low Income Weatherization Program, DSM Portfolio, Attachment 1

and weather-stripping as well as heating, cooling and water heating equipment will be severely degraded. Many homes will not meet even minimum code requirements for electrical, mechanical, or plumbing.

Program Eligibility

All existing single family homes and mobile homes that receive gas service from UNSG, with household income at or below the guidelines established by the Arizona Department of Energy Weatherization will be eligible for participation. Homes must be owner-occupied or owners who have rental property occupied by low-income participants must sign off to approve any work completed by agencies. All participants must have household income levels at or below 150% of the poverty level.

NACOG, CCCS, WACOG, ~~and~~ SEACAP and other participating agencies will determine the customer priority based on a number of factors including but not limited to:

- No heat (winter) or no cooling (summer) is high priority;
- Elderly and minor children;
- Physical handicap or illness; and
- ~~Age (80 or above or households with children age 10 or under receive high priority);~~
- ~~Doctor recommendations due to physical handicap or illness receives high priority; and~~
- Number of people in household.

Some agencies ~~NACOG and WACOG~~ also conduct work related to Emergency Home Repair as funding is available. These homes may not necessarily require weatherization measures, but UNSG believes they present additional opportunities for agencies to include some basic and quick installations of energy saving measures. UNSG will request installation of low-flow shower heads, faucet aerators, CFLs and hot water heater blankets, if necessary, when agencies complete Emergency Home Repair work. UNSG believes that these additions during an Emergency Home Repair visit add value to each customer and bolster energy and demand reductions.

Program Rationale

State, local, and federal funding ~~available to non-profit agencies~~ for assistance to low-income customers falls far short of the need that currently exists. Available funding also limits the amount of dollar benefit per household, the type of work it is used for and the amount of dollars allowed for program implementation and administration. Agencies also are limited on the number of homes they can weatherize each year because of a shortage of skilled labor to complete the necessary work, funding to add skilled labor, and the ability to find ~~competent and honest~~ outside contractors to complete the work.

UNSG funding allows agencies the ability to leverage other funds provided by the Federal Department of Energy ("DOE") and the Low Income Home Energy Assistance Program ("LIHEAP"). UNSG funding allows agencies to complete additional home repair, equipment repair or replacement, and nominal weatherization steps that impact energy consumption. Data provided by NACOG indicates that low-income customers that it serves receive $2.32 of energy efficiency improvements for every $1.00 funded

by UNSG because of the ability to leverage other funds. As a result, agencies are able to complete more thorough repair or renovation on each home.

Program Objectives

- Coordinate with Department of Commerce Energy Office (AEO) to follow approved state Weatherization Assistance Program (WAP) rules when using funding from UNSG (Appendix 1);
- Allow up to $2,000~~.00~~ per residence for weatherization, equipment repair, etc. for low-income customers.~~;~~ Agencies may request a waiver of the $2,000.00 limitation on a case-by-case basis;
- Increase the number of homes weatherized or the extent of repair completed at each home;
- Lower the average household energy consumption ~~costs~~ for low-income customers; and
- Improve the quality of life for low-income customers ~~in low-income neighborhoods~~.

Products and Services Provided

Allowable weatherization measures to meet the WAP rules can be placed in four major categories: 1) duct repair; 2) pressure management/infiltration control; 3) attic insulation; and 4) the repair or replacement of appliances which are not operational or pose a health hazard. Typical services include installing insulation, sealing ducts and balancing air-flow, pressure diagnostics and repair, tuning and repairing cooling and heating systems, and reducing heat gain through windows. Agency representatives will determine from an audit or on-site analysis of the building, which items ~~to be installed in each home~~ meet the cost-effectiveness test and will be installed in each home.

~~Analysis has been completed on a defined list of energy efficiency measures to determine energy and demand impact. This list is included as the measure level energy savings analysis in Appendix 2.~~
Agencies will be allowed to use UNSG funding up to the maximum allowance of $2,000 per home. Funding provided to LIW agencies from Department of Energy (DOE) limits installation of items installed to only those measures that combined, contribute a minimum of 20% energy savings due to LIHEAP DOE requirements. Funding from UNSG will ~~not~~ be limited to ~~a 20% energy savings and may allow agencies to complete additional work in each home. Agency representatives will determine which items should be installed in each home. Some agencies limit measures installed to only those measures that contribute a minimum of 20% energy savings due to LIHEAP requirements. Other agencies are limited to assistance for equipment repair and/or replacement.~~installation of measures which meet the cost-effectiveness tests and priority outlined in the WAP rules.

Agencies will be asked to install certain energy saving products in any home they enter through the emergency repair and/or flood repair programs. This will support an increase in installation of low-flow shower heads, faucet aerators, CFLs or hot water heater blankets.

The WAP rules also consider combustion safety, a critical step to assure the health and safety of occupants. Agencies are allowed to complete with UNSG funding, any work related to health and safety that is normally considered in the WAP rules but funding for health and safety repairs must not exceed 25% of the available funds for each home and will be reported separately.

Delivery Strategy and Administration

- Promotion of the LIW Program will occur through NACOG, CCCS, WACOG and SEACAP;
- Funding will be provided to agencies from UNSG upon documentation of work completed;
- NACOG, CCCS, WACOG and SEACAP will determine participant eligibility and priority and will complete all work; ~~and~~
- NACOG , CCCS, WACOG and SEACAP will provide program administration, marketing, planning, coordination, labor, materials, equipment and entering results into tracking software; ~~and~~
- The participating agencies will complete the on-line process outlined by AEO for data collection and data input and the AEO will work with UNSG to provide reports necessary for ACC reporting requirements.

Marketing and Communications

When appropriate, UNSG employees inform customers about the program, local Department of Economic Security ("DES") representatives make referrals, health care service agencies and individual case workers also make referrals. UNSG provides a page on its Web site that directs interested parties to call the NACOG, CCCS, WACOG or SEACAP.

Program Implementation Schedule

UNSG intends to continue the existing LIW Program until the implementation of any new program elements. This will provide time to transition agencies to new program elements following approval by ACC.

~~The following table~~Table 1 shows the estimated timeline for key program activities by quarter assuming program approval by the ACC by the third quarter of 2007:

Table 1. Program Implementation Schedule

Program Activities	2007				2008				2009			
Continue ongoing LIW program												
New program pre-approval submit												
New program approval (estimated)												
Meetings/Notifications to Agencies												
Implementation by Agencies												
Process evaluation												
Savings verification												
Program redesign as needed												

Monitoring and Evaluation Plan

Development of this ~~e~~new program requires that Weatherization measures must pass the cost-effectiveness test that is detailed in the state WAP rules. These rules allow certain measures with a priority list for completion. Measures vary by climate zone and type of housing construction. Measures not on the list must be assessed by a computer analysis to determine the economic feasibility and ~~-~~ savings

will be tracked. UNSG will require agencies to utilize the AEO on-line process to provide information of each measure installed along with the appropriate address, dates, and other information.

~~The current LIW Program generated no claims from UNSG of energy savings because individual measures were not tracked. Development of the new program, however, will include calculations for energy savings and therefore work completed at each location will be tracked. UNSG plans to pursue development of an on-line process agencies can use to provide information of each measure installed with appropriate address, dates, and other information.~~

UNSG will adopt a strategy that calls for integrated data collection that is designed to provide a quality data resource for program tracking, management and evaluation. This approach will entail the following primary activities:

- **Database management** – As part of program operation, ~~UNSG~~participating agencies will collect the necessary data elements and AEO will ~~to populate the tracking database and~~ provide periodic reporting.
- **Integrated implementation data collection** – UNSG and AEO will establish systems to collect the data needed to support effective program management and evaluation ~~will work with the implementation contractor to establish systems to collect the data needed to support effective program management and evaluation through the implementation and customer application processes. The database tracking system will be integrated with implementation data collection processes.~~
- **Field verification** – ~~UNSG will~~ AEO or their designated contractor will conduct field verification of the installation of a sample of measures throughout the implementation of the program.
- **Tracking of savings using deemed savings values** – AEO will develop savings values for each measure and technology promoted by the program, and periodically review and revise the savings values through bill analysis. ~~UNSG will develop deemed savings values for each measure and technology promoted by the program and periodically review and revise the savings values to be consistent with program participation and accurately estimate the savings being achieved by the program.~~

~~This approach will provide UNSG with ongoing feedback on program progress and enable management to adjust or correct the program measures to be more effective, provide a higher level of service, and be more cost beneficial. Integrated data collection will provide a high quality data resource for evaluation activities.~~

Program Budget (Future)

The 2008 program year annual budget of approximately $113,400 will be allocated as shown in Table 2, while Table 3 provides the expected program budgets through 2012, which includes an escalation rate of 3% per year. ~~Allowing for a 3% annual inflation rate, the average annual budget is approximately $120,411. Appendix 1 provides addition details on the 2008 budget.~~

Table 2. 2008 Program Budget

Total Program Budget	**$113,400**	**Allocation Rate**
Total Administrative and O&M Cost Allocation		**~~Percent~~**
Managerial & Clerical	$~~15,309~~5,897	~~13~~.5.2%

Travel & Direct Expenses	$0	0%
Overhead	$1,701590	1.50.5%
Total Administrative Cost	***$17,0106,487***	15.07%
Total Marketing Allocation		
Internal Marketing Expense	$0	0%
Subcontracted Marketing Expense	$0	0%
Total Marketing Cost	***$0***	0%
Total Direct Implementation		
Financial Incentives	$896,343621	8765.2%
Support Activity Labor (Arizona Energy Office)	$23,756000	2.6%
Hardware & Materials	$0	0%
Rebate Processing & Inspection	$2,756	2.4%
Total Direct Installation Cost	***$91,854102,377***	9810.3%
Total EM&V Cost Allocation		
EM&V / Research Activity	$4,082	43.6%
EM&V Overhead	$454	0.4%
Total EM&V Cost	***$4,536***	4.0%

Table 3. 2008 – 2012 Program Budget

Year	2008	2009	2010	2011	2012
Total Budget	$113,400	$116,802	$120,306	$123,915	$127,63
Incentives	$86,34396,621	$88,93399,520	$91,601102,506	$94,349105,581	$97,180108,74
Administrative and EM&V Costs	$27,05713,779	$27,86914,282	$28,70514,800	$29,56615,334	$30,45315,88
Support Activity Labor (AEO)	$3,000	$3,000	$3,000	$3,000	$3,00
Incentives as % of Budget	7685.2%	85.276%	7685.2%	7685.2%	7685.2%

Estimated Energy Savings

UNSG The program expects that, on average 42 low income customers will be served annually throughout UNSG service territory through a combination of all four agencies. The demand and energy savings from this activity are presented in Table 45. The kW and kWh factors used to calculate the savings are based on data from the AEO study of 150 weatherized homes included in Appendix 2[1]. The study provides present value calculations for the measures allowed by WAP. UNSG calculated a future value from the AEO calculations for zone III (Prescott) for evaporative cooling and zone IV (Tucson) for heating. UNSG adjusted heating savings from zone IV for UNSG service territory to account for higher heating degree days, and calculated energy reduction by dividing the dollars saved by the average cost per kWh or average cost per therm. The average per site energy and demand savings per home extracted from the AEO study are estimated to be 260 'equivalent kWh', 353 'equivalent therms' and 0.14 kW and is included in Appendix 3. AEO is analyzing the electric and gas energy used in weatherized homes before and after the weatherization measures are implemented. As the data base grows over time a more accurate picture of the impact of weatherization activities will emerge and savings values will be adjusted accordingly-.

~~Appendix 2 provides further information about estimated energy savings for each measure, including the measure and program level benefit cost analysis. The average per site energy savings of approximately~~

[1] Report titled "Present Value Analysis, SWG Low-Income Weatherization Program July 1, 1999 to June 31, 2000" provided by the Arizona Energy Office, August, 2007 as the basis for estimating measure savings for low income customers.

~~1,167 kWh and 79 Therms are expected to reduce customer bills by approximately 15% and 16%, respectively, and save $206 annually.~~

Table 4. Low Income Weatherization Program Annual Energy Savings

Energy and Demand Reductions	2008	2009	2010	2011	2012
Number of customers	40	41	42	43	45
Non-coincident peak (kW)	5.69~~15~~	5.83~~16~~	5.97~~16~~	6.11~~16~~	6.40~~16~~
Coincident peak (kW)	0.83~~3~~	0.85~~3~~	0.87~~4~~	0.89~~4~~	0.93~~4~~
Energy Savings (kWh)	10,383 ~~46,178~~	10,64 ~~347564~~	10,902 ~~48,991~~	11,162 ~~50,460~~	11,681 ~~51,974~~
Energy Savings (Therms)	14,119~~3,127~~	14,472~~3,221~~	14,825~~3,318~~	15,178~~3,417~~	15,884~~3,520~~

In addition to ~~As a result of~~ the energy savings shown above, it is estimated that the program will produce the additional water and emissions ~~environmental~~reductions benefits ~~through avoided emissions and avoided water use. The estimated additional benefits~~ from 2008 – 2012 ~~are~~ presented in Table 5.

~~**Table 5. Projected Environmental Benefits, 2008 – 2012**~~

~~CO_2 Emissions Avoided~~	~~210~~	~~Tons~~
~~Water Saved~~	~~57,124~~	~~Gal~~

Table 5. Projected Environmental Benefits, 2008 – 2012

Water Saved (utility only)	12,762	Gallons
CO_2 (electricity savings only)	50,226	Pounds
CO_2 (gas savings only)	878,861	Pounds

Note: A portion of the CO_2, and all of the water benefits are related to electricity savings and are based on Arizona Public Service Co. estimates as presented in the "APS Demand Side Management Program Portfolio 2005-2007" p. 20.

Program Cost Effectiveness

Program cost-effectiveness for the Low Income Weatherization program is evaluated based on the customer economic impact for participation in the program. Unlike the other programs proposed in UNSG's overall DSM portfolio which measure program cost-effectiveness based on societal benefit/cost tests and utility avoided costs, the benefit/cost of the low income program is evaluated based on the customer economics for personal participant savings versus program costs. This approach is consistent with the benefit/cost methodology used by the Arizona Energy Office and as used in Arizona Public Service Company's Low Income Weatherization program filings.

~~The cost effectiveness of each measure and the program as a whole was assessed using the Total Resource Cost ("TRC") test, the Societal Cost ("SC") test and the Ratepayer Impact Measure ("RIM") test as defined by the California Standard Practice Manual. Measure analysis worksheets showing all energy savings, cost and cost-effectiveness calculations are included in Appendix 2.~~

~~The cost effectiveness analysis requires estimation of:~~

- ~~net demand and energy savings attributable to the program;~~
- ~~UNSG program administration costs;~~

- the present value of program benefits including UNSG avoided costs over the life of the measures; and
- UNSG lost revenues.

Table 6 provides a summary of the benefit/cost analysis results for this program. A detailed benefit/cost analysis is presented in Appendix 2.

Table 6. Benefit-cost Analysis Results

Cost Effectiveness Tests	TRC	SC	RIM
Benefit/Cost Ratio	0.44	0.54	0.34

Table 6. Estimated UNSG Weatherization Savings per Home

Savings Per Home	Units Saved/Yr	Savings/Yr/House	Savings/House/Measure Life
kWh	260	$26	$393
Therms	353	$487	$7,307
kW	0.02	n/a	n/a
TOTAL		$513	$7,700

Measure life	15
$/kWh	0.101
$/therm	1.38
Houses Served (2008-2012)	211

Table 7 provides addition program and financial assumptions, by measure category, used to derive the program level cost-benefits. Additional details for each measure category can be found in Appendix 2.

Table 7. Other Financial Assumptions

PROGRAM DATA	Lighting	Weather	Insulation	HVAC	Hot Water	Appliances	Health and Safety
Conservation Life (yrs):	5	10	20	15	5	10	15
Program Life (yrs):	5	5	5	5	5	5	5
Demand Avoided Costs ($/kW):	55.23	58.74	64.94	61.99	55.23	58.74	61.99
Summer Energy Avoided Costs ($/kWh):	0.0722	0.0707	0.0731	0.0722	0.0722	0.0707	0.0722
Winter Energy Avoided Costs ($/kWh):	0.0701	0.0686	0.0707	0.0694	0.0701	0.0686	0.0694
Levelized Therms:	0.8691	0.8920	0.9451	0.9194	0.8691	0.8920	0.9194
Admin. Costs:	31.34%	31.34%	31.34%	31.34%	31.34%	31.34%	31.34%
TRC Discount Rate:	8.50%	8.50%	8.50%	8.50%	8.50%	8.50%	8.50%
Social Discount Rate:	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
NTG Ratio:	100%	100%	100%	100%	100%	100%	100%

~~A detailed benefit/cost analysis is presented in Appendix 4.~~

Table 7. Program Benefit/Cost: Based on Participant Economics for KWh and Therm Savings (2008-2012)

Savings	Low Income Total Participant Benefits	Total Program Costs	Net Benefits	Benefit/Cost Ratio
Participants Lifetime kWh & Therm Savings	$1,624,711	$602,056	$1,022,655	2.70

Low Income Weatherization Program

Appendix 1 – Program Costs

Budget Items	Budget	Allocation Rate (%)
Administrative	-	-
Managerial and Clerical Labor	*$15,309*	-
Labor - Clerical	$612	4.0%
Labor - Program Design	$612	4.0%
Labor - Program Development	$612	4.0%
Labor - Program Planning	$2,296	15.0%
Labor - Program/Project Management	$1,531	10.0%
Labor - Staff Management	$765	5.0%
Labor - Staff Supervision	$765	5.0%
Subcontractor Labor - Clerical	$765	5.0%
Subcontractor Labor - Program Design	$4,593	30.0%
Subcontractor Labor - Program Development	$765	5.0%
Subcontractor Labor - Program Planning	$765	5.0%
Subcontractor Labor - Program/Project Management	$1,225	8.0%
Subcontractor Labor - Staff Management	$0	0.0%
Subcontractor Labor - Staff Supervision	$0	0.0%
Subtotal Managerial and Clerical Labor	*$15,309*	*100.0%*
Travel & Direct Expenses	*$0*	-
Conference Fees	$0	30.0%
Labor - Conference Attendance	$0	20.0%
Subcontractor - Conference Fees	$0	2.0%
Subcontractor - Travel - Airfare	$0	4.0%
Subcontractor - Travel - Lodging	$0	0.0%
Subcontractor - Travel - Meals	$0	0.0%
Subcontractor - Travel - Mileage	$0	0.0%
Subcontractor - Travel - Parking	$0	0.0%
Subcontractor - Travel - Per Diem for Misc. Expenses	$0	8.0%
Subcontractor Labor - Conference Attendance	$0	2.0%
Travel - Airfare	$0	14.0%
Travel - Lodging	$0	6.0%
Travel - Meals	$0	3.0%
Travel - Mileage	$0	1.0%
Travel - Parking	$0	0.0%
Travel - Per Diem for Misc. Expenses	$0	10.0%
Travel & Direct Expenses	*$0*	*100.0%*
Overhead (General and Administrative) - Labor and Materials	*$1,701*	-
Equipment - Communications	$34	2.0%

~~Equipment - Computing~~	~~$34~~	~~2.0%~~
~~Equipment - Document Reproduction~~	~~$34~~	~~2.0%~~
~~Equipment - General Office~~	~~$34~~	~~2.0%~~
~~Equipment - Transportation~~	~~$34~~	~~2.0%~~
~~Facilities - Lease/Rent Payment~~	~~$0~~	~~0.0%~~
~~Labor - Accounts Payable~~	~~$17~~	~~1.0%~~
~~Labor - Accounts Receivable~~	~~$17~~	~~1.0%~~
~~Labor - Administrative~~	~~$17~~	~~1.0%~~
~~Labor - Automated Systems~~	~~$0~~	~~0.0%~~
~~Labor - Communications~~	~~$17~~	~~1.0%~~
~~Labor - Contract Reporting~~	~~$17~~	~~1.0%~~
~~Labor - Corporate Services~~	~~$17~~	~~1.0%~~
~~Labor - Facilities Maintenance~~	~~$17~~	~~1.0%~~
~~Labor - Information Technology~~	~~$17~~	~~1.0%~~
~~Labor - Materials Management~~	~~$17~~	~~1.0%~~
~~Labor - Procurement~~	~~$17~~	~~1.0%~~
~~Labor - Regulatory Reporting~~	~~$680~~	~~40.0%~~
~~Labor - Shop Services~~	~~$17~~	~~1.0%~~
~~Labor - Telecommunications~~	~~$17~~	~~1.0%~~
~~Labor - Transportation Services~~	~~$17~~	~~1.0%~~
~~Office Supplies~~	~~$17~~	~~1.0%~~
~~Postage~~	~~$17~~	~~1.0%~~
~~Subcontractor - Equipment - Communications~~	~~$0~~	~~0.0%~~
~~Subcontractor - Equipment - Computing~~	~~$0~~	~~0.0%~~
~~Subcontractor - Equipment - Document Reproduction~~	~~$0~~	~~0.0%~~
~~Subcontractor - Equipment - General Office~~	~~$0~~	~~0.0%~~
~~Subcontractor - Equipment - Transportation~~	~~$0~~	~~0.0%~~
~~Subcontractor - Facilities - Lease/Rent Payment~~	~~$0~~	~~0.0%~~
~~Subcontractor - Office Supplies~~	~~$0~~	~~0.0%~~
~~Subcontractor - Postage~~	~~$0~~	~~0.0%~~
~~Subcontractor Labor - Accounts Payable~~	~~$0~~	~~0.0%~~
~~Subcontractor Labor - Accounts Receivable~~	~~$0~~	~~0.0%~~
~~Subcontractor Labor - Administrative~~	~~$0~~	~~0.0%~~
~~Subcontractor Labor - Automated Systems~~	~~$0~~	~~0.0%~~
~~Subcontractor Labor - Communications~~	~~$0~~	~~0.0%~~
~~Subcontractor Labor - Contract Reporting~~	~~$0~~	~~0.0%~~
~~Subcontractor Labor - Corporate Services~~	~~$0~~	~~0.0%~~
~~Subcontractor Labor - Facilities Maintenance~~	~~$0~~	~~0.0%~~
~~Subcontractor Labor - Information Technology~~	~~$0~~	~~0.0%~~
~~Subcontractor Labor - Materials Management~~	~~$0~~	~~0.0%~~
~~Subcontractor Labor - Procurement~~	~~$0~~	~~0.0%~~

Subcontractor Labor - Regulatory Reporting	$595	35.0%
Subcontractor Labor - Shop Services	$0	0.0%
Subcontractor Labor - Telecommunications	$0	0.0%
Subcontractor Labor - Transportation Services	$0	0.0%
Subtotal Overhead	*$1,701*	*100.0%*
Total Administrative Costs	**$17,010**	-
Marketing/Advertising/Outreach	-	-
Internal Marketing Expense	***$0***	-
Advertisements / Media Promotions	$0	25.0%
Bill Inserts	$0	4.0%
Brochures	$0	6.0%
Door Hangers	$0	0.0%
Labor - Business Outreach	$0	5.0%
Labor - Customer Outreach	$0	5.0%
Labor - Customer Relations	$0	5.0%
Labor - Marketing	$0	30.0%
Print Advertisements	$0	15.0%
Radio Spots	$0	5.0%
Subtotal Internal Marketing Expense	*$0*	*100.0%*
Subcontracted Marketing Expense	***$0***	-
Subcontractor - Bill Inserts	$0	5.0%
Subcontractor - Brochures	$0	5.0%
Subcontractor - Door Hangers	$0	0.0%
Subcontractor - Print Advertisements	$0	0.0%
Subcontractor - Radio Spots	$0	10.0%
Subcontractor - Television Spots	$0	0.0%
Subcontractor Labor - Business Outreach	$0	5.0%
Subcontractor Labor - Customer Outreach	$0	5.0%
Subcontractor Labor - Customer Relations	$0	5.0%
Subcontractor Labor - Marketing	$0	5.0%
Television Spots	$0	0.0%
Website Development	$0	60.0%
Subtotal Subcontracted Marketing Expense	*$0*	*100.0%*
Total Marketing/Advertising/Outreach	**$0**	-
Direct Implementation	-	-
Financial Incentives to Customers	***$86,343***	-
Activity - Labor	***$2,756***	-
Labor - Curriculum Development	$220	8.0%
Labor - Customer Education and Training	$1,102	40.0%
Labor - Customer Equipment Testing and Diagnostics	$0	0.0%

Low Income Weatherization Program

Labor - Facilities Audits	$827	30.0%
Subcontanctor Labor - Facilities Audits	$276	10.0%
Subcontractor Labor - Curriculum Development	$138	5.0%
Subcontractor Labor - Customer Education and Training	$138	5.0%
Subcontractor Labor - Customer Equipment Testing and Diagnostics	$55	2.0%
Subtotal Activity	*$2,756*	*100.0%*
Hardware and Materials - Installation and Other DI Activity	***$0***	-
Audit Applications and Forms	$0	8.0%
Direct Implementation Literature	$0	20.0%
Education Materials	$0	20.0%
Energy Measurement Tools	$0	10.0%
Installation Hardware	$0	10.0%
Subcontractor - Direct Implementation Literature	$0	4.0%
Subcontractor - Education Materials	$0	4.0%
Subcontractor - Energy Measurement Tools	$0	16.0%
Subcontractor - Installation Hardware	$0	6.0%
Subcontractor -Audit Applications and Forms	$0	2.0%
Subtotal Hardware and Materials	*$0*	*100.0%*
Rebate Processing and Inspection - Labor and Materials	***$2,756***	-
CARE Billing Assistance	$2,756	100.0%
Labor - Rebate Processing	$0	0.0%
Labor - Site Inspections	$0	0.0%
Rebate Applications	$0	0.0%
Subcontractor - Rebate Applications	$0	0.0%
Subcontractor Labor - Field Verification	$0	0.0%
Subcontractor Labor - Rebate Processing	$0	0.0%
Subcontractor Labor - Site Inspections	$0	0.0%
Subtotal Rebate Processing and Inspection	*$2,756*	*100.0%*
Total Direct Implementation	**$91,854**	-
Evaluation, Measurement and Verification	-	-
EM&V Labor and Materials	***$4,082***	-
Labor - EM&V	$204	5.0%
Materials - EM&V	$204	5.0%
Subcontractor Labor - EM&V	$3,674	90.0%
Subtotal EM&V Activity - Labor	*$4,082*	*100.0%*
EM&V Overhead	***$454***	-
Benefits - EM&V Labor	$0	0.0%
Overhead - EM&V	$227	50.0%
Subcontractor Overhead - EM&V	$0	0.0%
Subcontractor Travel - EM&V	$0	0.0%
Travel - EM&V	$227	50.0%

~~*Subtotal EM&V Overhead*~~	~~*$454*~~	~~*100.0%*~~
~~***Total EM&V***~~	~~**$4,536**~~	-
~~**Total Budget**~~	~~**$113,400**~~	-

~~Appendix 2 – Benefit/Cost Analysis~~

~~Key benefit – cost metrics~~

RATE DATA	
Rate Class: CARES	
$/kW:	0.00
$/kWh, On-Peak:	0.10
$/kWh, Off-Peak:	0.10
$/Therm	1.40

OPERATING DATA	
Average measure life	12.616
Average coincidence	0.22

OTHER FACTORS	
Line Loss Factor:	10.69%
Capacity Reserve Factor:	0.00%
Application:	RET
Cost Basis:	Full Installed

PROGRAM DATA	Ltg.	Weath.	Insul.	HVAC	DHW	Appl.	H&S
Conservation Life (yrs):	5	10	20	15	5	10	15
Program Life (yrs):	5	5	5	5	5	5	5
Demand AC ($/kW):	55.23	58.74	64.94	61.99	55.23	58.74	61.99
Summer Energy AC ($/kWh):	0.0722	0.0707	0.0731	0.0722	0.0722	0.0707	0.0722
Winter Energy AC ($/kWh):	0.0701	0.0686	0.0707	0.0694	0.0701	0.0686	0.0694
Levelized Therms	0.8691	0.8920	0.9451	0.9194	0.8691	0.8920	0.9194
Admin. Costs:	31.34%	31.34%	31.34%	31.34%	31.34%	31.34%	31.34%
IRP Discount Rate*****:	8.50%	8.50%	8.50%	8.50%	8.50%	8.50%	8.50%
~~Social Discount Rate~~	~~5.00%~~	~~5.00%~~	~~5.00%~~	~~5.00%~~	~~5.00%~~	~~5.00%~~	~~5.00%~~
NTG Ratio:	100%	100%	100%	100%	100%	100%	100%

DEMAND/ENERGY SAVINGS					INCENTIVE CALCULATIONS						CUSTOMER COST/SAVINGS				TRC
Measure Description	Non Coin. Demand Savings (KW)	Summer Energy Savings (KWh)	Winter Energy Savings (KWh)	Energy Savings (Therms)	IRP PV Benefit ($)	Social PV Benefit ($)	Incentive ($)	% PV	PV Program Cost ($)	NPV ($)	Incr. Cost ($)	Cost Savings ($)	Payback wo/Inc. (yrs)	Payback w/Inc. (yrs)	BC Ratio
Lighting Total	0.275	143.8	143.8	0.0	$155	$171	$72	$0	$95	$60	$72.40	$28	2.6	0.0	1.63
Weatherization Total	0.000	21.3	21.3	24.6	$166	$195	$241	$1	$316	-$151	$240.80	$39	6.2	0.0	0.52
Insulation Total	0.000	127.1	127.1	10.6	$286	$377	$258	$1	$338	-$52	$257.66	$40	6.5	0.0	0.85
HVAC Total	0.080	235.6	101.0	18.9	$410	$513	$1,096	$3	$1,439	-$1,029	$1,096.02	$59	18.5	0.0	0.29
Domestic Hot Water Total	0.000	9.3	9.3	17.4	$65	$72	$226	$3	$297	-$232	$226.39	$26	8.7	0.0	0.22
Appliances Total	0.026	113.8	113.8	1.0	$132	$155	$248	$2	$325	-$193	$247.75	$24	10.5	0.0	0.41
Health and Safety	0.000	0.0	0.0	6.6	$50	$63	$41	$1	$54	-$4	$41.25	$9	4.5	0.0	0.93
Total All Projects	0.381	650.881	516.259	79.038	1265.338	1545.615	2182.274	11.654	2866.133	-1600.795	2182.274	224.084	57.560	0.000	0.4415

~~Unit capacity and energy savings~~

Low Income Weatherization Program

Per Unit

DEMAND/ENERGY SAVINGS							CUSTOMER COST/SAVINGS
Measure Description	Unit	Non-Coin. Demand Savings (KW)	Coin. Factor	Coin. Demand Savings (KW)	Energy Savings (KWh)	Energy Savings (Therms)	Incr. Cost ($)
LIGHTING MEASURES							
- Standard CFL		0.052	75%	0.04	56.94	0	13.80
- 3-way CFL		0.070	75%	0.05	60.05	0	16.20
- R-30 and R-40		0.067	75%	0.05	57.47	0	14.50
- 3w and 7w		0.018	75%	0.01	15.44	0	7.00
- Torchiere lamp		0.245	75%	0.18	268.28	0	65.00
- Nite Lite/Lime Lite		0.007	75%	0.01	25.45	0	5.00
WEATHERIZATION MEASURES							
Interior/Exterior Caulking	per site	0.00		0.00	0.64	0.010	$52.00
Aerosol Foam Sealant	per site	0.00		0.00	1.14	0.018	$52.00
Door Weatherstrip		0.00		0.00	0.65	0.010	$53.00
Window Weatherstrip	per united inch	0.00		0.00	0.15	0.242	$0.10
Door Sweep		0.00		0.00	9.09	0.145	$23.00
Replace standard hollow door with insulated door		0.00		0.00	15.15	0.228	$93.00
Replace broken single-pane windows with double pane/low e window (need energy impact)	per sq ft	0.00		0.00	1.31	0.020	$17.00
INSULATION MEASURES							
Attic Insulation							
-Blown cellulose, unfloored							$0.27
R-11	Per Sq.Ft.	0.00		0.00	214.61	2.239	$0.27
R-15	Per Sq.Ft.	0.00		0.00	184.46	1.888	$0.27
R-19	Per Sq.Ft.	0.00		0.00	183.29	1.866	$0.27
R-23	Per Sq.Ft.	0.00		0.00	164.37	1.696	$0.27
R-27	Per Sq.Ft.	0.00		0.00	161.43	1.669	$0.27
R-30	Per Sq.Ft.	0.00		0.00	161.28	1.670	$0.27
R-34	Per Sq.Ft.	0.00		0.00	149.54	1.547	$0.27
R-38	Per Sq.Ft.	0.00		0.00	142.27	1.469	$0.27
-Blown cellulose, floored							

R-14	Per Sq.Ft.	0.00	0.00	188.31	1.980	$0.27
R-18	Per Sq.Ft.	0.00	0.00	185.08	1.917	$0.27
R-22	Per Sq.Ft.	0.00	0.00	170.23	1.748	$0.27
R-26	Per Sq.Ft.	0.00	0.00	164.11	1.694	$0.27
R-30			0.00	161.28	1.670	$0.27
-Fiberglass, batts						
-R13	Per Sq.Ft.	0.00	0.00	194.20	2.054	$0.27
-R19	Per Sq.Ft.	0.00	0.00	180.80	1.887	$0.27
-R30	Per Sq.Ft.	0.00	0.00	161.28	1.670	$0.27
-R38	Per Sq.Ft.	0.00	0.00	142.27	1.469	$0.27
Floor Insulation Fiberglass						
-R19 - including supports (batt hangers or twine)	Per Sq.Ft.	0.00	0.00	97.71	0.914	$0.27
-R30 - including supports (batt hangers or twine)	Per Sq.Ft.	0.00	0.00	87.45	0.899	$0.27
Add R5 duct insulation to gas heat/ elect AC (or coat to similar R value)		0.00	0.00	27.05	11.503	$132.00
Add R5 duct insulation to elect heat/ elect AC (or coat to similar R value)		0.00	0.00	278.12	0.000	$132.00
Sidewall Insulation (Blown In)						
- Asbestos Shingled	Per Sq.Ft.	0.00	0.00	86.25	1.097	$0.27
- Asphalt / Wood Siding	Per Sq.Ft.	0.00	0.00	86.25	1.097	$0.27
- Stucco Siding	Per Sq.Ft.	0.00	0.00	86.25	1.097	$0.27
Unfinished Wall Insulation						
- R19 Fiberglass	Per Sq.Ft.	0.00	0.00	77.58	0.993	$0.27
HVAC MEASURES						
Full tune-ups of Electric Furnace, Central A/C and Heat pumps by Comfort Partners qualified technician with invoice attached.	0	0.00	331	4.50	$300	
Central A/C Filter (cleaning or replacement)	0	0.00	132	1.50	$35	
Central A/C Coil (cleaning)	0	0.00	132	0.60	$250	
Sealing ducts with mastic		0.00	24	3.43	$282	
Window/wall AC Filter (cleaning or replacement)	0	0.00	55	0.00	$35	
Electric Heating System Thermostat (digital, line voltage)	0	0.00	196	0.00	$98	
Setback Thermostat	0	0.00	224	12.90	$126	
Furnace	0	0.00	0	29.70	$1,870	
Solar Screen	0	0.00	25	0.09	$225	
Install attic ventilation (only with AC)	0.1	0.10	0	0.00	$450	
Replace Single Speed cooler motor with 2-speed motor (1/3 - 1/2)	0.2	0.00	0	0.00	$210	
Replace Single Speed cooler Motor with 2-speed motor (3/4)	0.2	0.00	0	0.00	$230	
Plant trees on South and West Exposure (use 0.57 kW and 128 kWh annually per tree)	0.2	0.57	128	0.300	$63	
DOMESTIC HOT WATER MEASURES						
Water-saving Showerhead w /Massage (with shutoff 2.5 gpm or less)	0.00	0.00	308.25	9.97	$25	

Low Income Weatherization Program

Water-saving Hand Held Showerhead (with shutoff 2.5 gpm or less)	0.00		0.00	308.25	9.97	$23
Water Heater Insulation Blanket	0.00		0.00	167.44	5.60	$32
High Efficiency Water Heater - Gas, EF = 0.63	0.00		0.00	0.00	14.40	$449
High Efficiency Water Heater - Elect, EF = 0.93	0.00		0.00	93.00	0.00	$449
Faucet Flow restrictor	0.00		0.00	71.97	3.08	$8
Domestic Hot Water Pipe Insulation (seal all seams and joints; duct tape not permitted)	0.00		0.00	104.08	2.85	$12
APPLIANCES MEASURES						
15 c.f.	0.054	1	0.054	474.50	2.50	$478
18 c.f. w/ice	0.058	1	0.058	511.00	2.50	$645
18 c.f. w/o ice	0.058	1	0.058	511.00	2.50	$645
21 c.f. w/ice	0.079	1	0.079	689.85	2.50	$688
21 c.f. w/o ice	0.079	1	0.079	689.85	2.50	$688
HEALTH, SAFETY & MISCELLANEOUS MEASURES						
Install CO2 Sensor	0.058	1	0.000	0.00	0.00	$85
Repair/replace all connections related to installation and operation of evaporative cooler (no impact)	0.058	1	0.000	0.00	0.00	$150
Gas leak repair	0.000		0.000	0.00	65.70	$50

Per Site

DEMAND/ENERGY SAVINGS AND COSTS

Measure Description	Cost Unit	Cost Units per Site	Non-Coin. Demand Savings (KW)	Coin. Factor	Coin. Demand Savings (KW)	Energy Savings (KWh)	Energy Savings (Therms)	Incr. Cost ($)	% Incent per customer (%)
LIGHTING MEASURES									
- Standard CFL	Lamp	1	0.052	10%	0.01	56.94	0	$13.80	60%
- 3-way CFL	Lamp	1	0.070	10%	0.01	60.05	0	$16.20	60%
- R-30 and R-40	Lamp	1	0.067	10%	0.01	57.47	0	$14.50	60%
- 3w and 7w	Lamp	1	0.018	10%	0.00	15.44	0	$7.00	60%
- Torchiere lamp	Lamp	1	0.245	10%	0.02	268.28	0	$65.00	60%

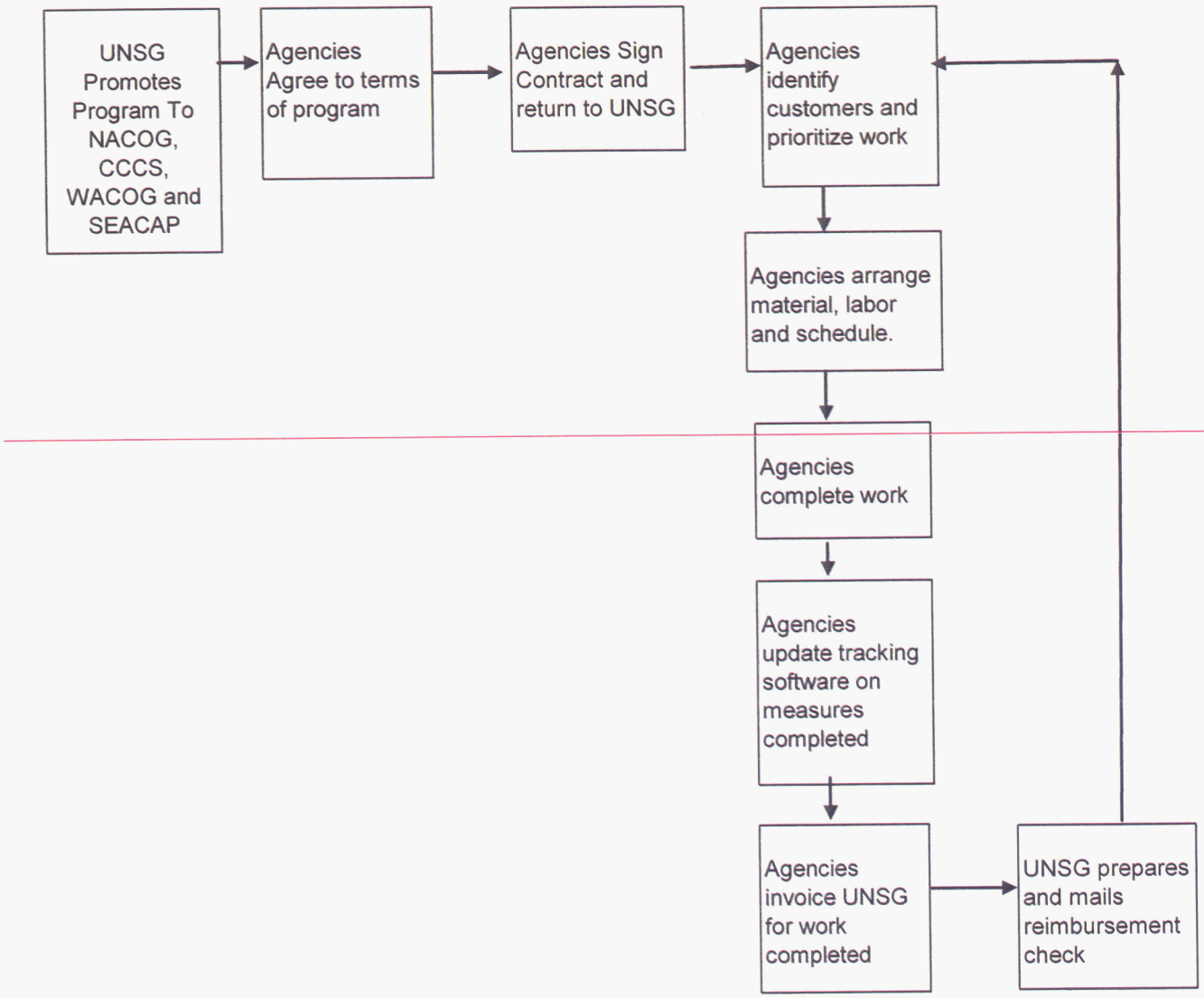
- Nite Lite/Lime Lite	Lamp	1	0.007	10%	0.00	25.45	0	$5.00	50%
Weigheted Average Lighting			0.275		0.027	287.633	0.000	$72.40	
WEATHERIZATION MEASURES									
Interior/Exterior Caulking	per site	1	0.00		0.00	0.64	0.010	$52.00	80%
Aerosol Foam Sealant	per site	1	0.00		0.00	1.14	0.018	$52.00	20%
Door Weatherstrip	per unit	1	0.00		0.00	0.65	0.010	$53.00	100%
Window Weatherstrip	per inch	100	0.00		0.00	15.23	24.193	$10.00	100%
Door Sweep	per unit	2	0.00		0.00	18.17	0.290	$46.00	100%
Replace standard hollow door with insulated door	per door	1	0.00		0.00	15.15	0.228	$93.00	20%
Replace broken single-pane windows with double pane/low e window (need energy impact)	per sq ft	9	0.00		0.00	11.79	0.176	$153.00	40%
Weigheted Average Weatherization			0.000		0.000	42.542	24.621	$240.80	460%
INSULATION MEASURES									
Attic Insulation									
-Blown cellulose, unfloored									
R-11	Per Sq.Ft.	1000	0.00		0.00	321.92	13.435	$270.00	4.35%
R-15	Per Sq.Ft.	1000	0.00		0.00	276.69	11.330	$270.00	4.35%
R-19	Per Sq.Ft.	1000	0.00		0.00	274.94	11.197	$270.00	4.35%
R-23	Per Sq.Ft.	1000	0.00		0.00	246.55	10.173	$270.00	4.35%
R-27	Per Sq.Ft.	1000	0.00		0.00	242.14	10.015	$270.00	4.35%
R-30	Per Sq.Ft.	1000	0.00		0.00	241.93	10.019	$270.00	4.35%
R-34	Per Sq.Ft.	1000	0.00		0.00	224.31	9.283	$270.00	4.35%
R-38	Per Sq.Ft.	1000	0.00		0.00	213.41	8.814	$270.00	4.35%
-Blown cellulose, floored									
R-14	Per Sq.Ft.	1000	0.00		0.00	282.46	11.881	$270.00	4.35%
R-18	Per Sq.Ft.	1000	0.00		0.00	277.63	11.504	$270.00	4.35%
R-22	Per Sq.Ft.	1000	0.00		0.00	255.35	10.490	$270.00	4.35%
R-26	Per Sq.Ft.	1000	0.00		0.00	246.16	10.163	$270.00	4.35%
R-30	Per Sq.Ft.	1000	0.00		0.00	241.93	10.019	$270.00	4.35%
-Fiberglass, batts									
-R13	Per Sq.Ft.	1000	0.00		0.00	291.30	12.322	$270.00	4.35%
-R19	Per Sq.Ft.	1000	0.00		0.00	271.20	11.321	$270.00	4.35%
-R30	Per Sq.Ft.	1000	0.00		0.00	241.93	10.019	$270.00	4.35%
-R38	Per Sq.Ft.	1000	0.00		0.00	213.41	8.814	$270.00	4.35%
Floor Insulation Fiberglass									
-R19 - including supports (batt hangers or twine)	Per Sq.Ft.	500	0.00		0.00	146.57	5.482	$135.00	4.35%
-R30 - including supports (batt hangers or twine)	Per Sq.Ft.	500	0.00		0.00	131.18	5.396	$135.00	4.35%
Add R5 duct insulation to gas heat/ elect AC (or coat to similar R value)	Per home	1	0.00		0.00	27.05	11.503	$132.00	10.00%
Add R5 duct insulation to elect heat/ elect AC (or coat to similar R value)	Per home	1	0.00		0.00	278.12	0.000	$132.00	10.00%

Low Income Weatherization Program

Sidewall Insulation (Blown In)									
- Asbestos Shingled	Per Sq.Ft.	500	0.00		0.00	129.37	6.583	$135.00	4.35%
- Asphalt / Wood Siding	Per Sq.Ft.	500	0.00		0.00	129.37	6.583	$135.00	4.35%
- Stucco Siding	Per Sq.Ft.	500	0.00		0.00	129.37	6.583	$135.00	4.35%
Unfinished Wall Insulation									
- R19 Fiberglass	Per Sq.Ft.	200	0.00		0.00	116.37	5.957	$54	4.35%
Weigheted Average Insulation			0.000		0.000	254.233	10.602	$257.66	120%
HVAC MEASURES									
Full tune-ups of Furnace, Central A/C and Heat pumps	Per home	1	0.00		0.00	331.00	4.500	$300.00	40.00%
Central A/C Filter (cleaning or replacement)	Per home	1	0.00		0.00	132.34	1.500	$35.00	60.00%
Central A/C Coil (cleaning)	Per home	1	0.00		0.00	132.34	0.600	$250.00	25.00%
Sealing ducts with mastic	Per home	1	0.00		0.00	24.36	3.427	$282.46	60.00%
Window/wall AC Filter (cleaning or replacement)	Per home	1	0.00		0.00	55.31	0.000	$35.00	20.00%
Electric Heating System Thermostat (digital, line voltage)	Per home	1	0.00		0.00	196.45	0.000	$98.00	20.00%
Gas Heating System Thermostat (digital, line voltage)	Per home	1	0.00		0.00	0.00	12.900	$126.00	50.00%
Install 80 AFUE Furnace, increase AFUE by 15%	Per home	1	0.00		0.00	0.00	29.700	$1,870.00	25.00%
Solar Screen	Per home	1	0.00		0.00	25.00	0.092	$225.00	30.00%
Install attic ventilation (only with AC)	Per home	1	0.10	0	0.00	0.00	0.000	$450.00	10.00%
Replace Single Speed cooler motor with 2-speed motor (1/3 - 1/2)	Per home	1	0.20	0	0.00	0.00	0.000	$210.00	10.00%
Replace Single Speed cooler Motor with 2-speed motor (3/4)	Per home	1	0.20	0	0.00	0.00	0.000	$230.00	10.00%
Plant trees on South and West Exposure (use 0.57 kW and 128 kWh annually per tree)	Per home	1	0.20	1	0.20	128.00	0.300	$63.00	15.00%
Weigheted Average HVAC			0.080		0.030	336.554	18.854	1096.025	29%
DOMESTIC HOT WATER MEASURES									
Water-saving Showerhead w /Massage (with shutoff 2.5 gpm or less)		1	0.00		0.00	0.00	9.968	$25.03	10%
Water-saving Hand Held Showerhead (with shutoff 2.5 gpm or less)		1	0.00		0.00	0.00	9.968	$23.03	50%
Water Heater Insulation Blanket		1	0.00		0.00	0.00	5.600	$32.40	50%
High Efficiency Water Heater - Gas, EF = 0.63		1	0.00		0.00	0.00	14.400	$449.00	20%
High Efficiency Water Heater - Elect, EF = 0.93		1	0.00		0.00	93.00	0.000	$449.00	20%
Faucet Flow restrictor		2	0.00		0.00	0.00	6.152	$15.10	70%
Domestic Hot Water Pipe Insulation (seal all seams and joints; duct tape not permitted)		1	0.00		0.00	0.00	2.848	$12.00	50%
Weighted Average Domestic Hot Water			0.000		0.000	18.600	17.391	226.388	39%
APPLIANCES MEASURES									
15 c.f.		1	0.05	1	0.05	474.50	2.500	$478.00	10%
18 c.f. w/ice		1	0.06	1	0.06	511.00	2.500	$645.00	10%
18 c.f. w/o ice		1	0.06	1	0.06	511.00	2.500	$645.00	5%
21 c.f. w/ice		1	0.08	1	0.08	689.85	2.500	$688.00	10%

21 c.f. w/o ice		1	0.08	1	0.08	689.85	2.500	$688.00	5%
Weighted Average Appliances			0.026		0.026	227.578	1.000	247.750	8%
HEALTH, SAFETY & MISCELLANEOUS MEASURES									
Install CO2 Sensor	Per home	1	0.00	1	0.00	0.00	0.000	$85.00	25%
Repair/replace all connections related to installation and operation of evaporative cooler (no impact)	Per home	1	0.00	1	0.00	0.00	0.000	$150.00	10%
Gas leak repair	Per home	1	0.00	1	0.00	0.00	65.700	$50.00	10%
Weigheted Average H&S			0.000		0.000	0.000	6.570	41.250	15%

Appendix 3 - Low Income Weatherization Program Implementation Process



Appendix 1: Weatherization Assistance Program Requirements

JULY 1, 2006
EDITION

CONTRACTUAL REQUIREMENTS

Financial Report and Budget Line Item Definitions

Administrative Costs
Cost of expenses incurred by the CONTRACTOR, but not directly attributed to the implementation of Weatherization or not easily segregated from the larger overhead or indirect costs of operating the Contractor's organization such as janitorial costs, executive director, finance officer, utility costs, reception area costs and related indirect costs.

Audit Costs
Cost of A-133 audit participation and costs of a Weatherization Assistance Program compliance audit.

Commerce
Arizona Department of Commerce.

Field Position(s) Expense(s).
Salary and employee related costs incurred for CONRACTOR program personnel serving as Weatherization crew technicians, energy auditors and field supervisors.

Other Program Support Expenses
Costs incurred for postage, telephone lines and service, printing and copying, general office supplies, computer hardware acquisition and computer software acquisition. Building permits and fees necessary to the accomplishment of certain actions and investments upon a client and dwelling unit.

Other Program Support Position(s) Expense(s)
Salary and employee related costs incurred for CONTRACTOR program personnel serving in the capacity of any other program function but who are not in the field installing action items or directly supervising the activities of technicians who are engaged in the installation of action items.

Program Liability Insurance
Costs of obtaining liability insurance for the CONTRACTOR so that in the event of agency malfeasance or accident, the CONTRACTOR will have the financial resources necessary for restoration of property or to person(s).

Program Storage and Workshop Space
Costs incurred for the provision of materials storage and program work space such as workshops, tools and equipment storage space, program office area for energy auditors, field supervisors, inventory control specialist, out of workers, accountants, et al.

Program Vehicle Capital Expense
The initial cost of acquisition of program vehicles including all related costs involved in such investments.

Program Transportation Operations Expenses
The cost of mileage reimbursement; vehicle registration, vehicle insurance, maintenance (oil changes, tune-ups, etc.) and major repair & replacement (tires, batteries, fuel pump, alternators, brake job, etc.) and automotive fuels.

Sub Contracted Installation Expenses
The cost of any action item or measure installed by other than the crew of a subgrantee.

Sub Contracted Health & Safety Investments
The total cost of action items or measures installed by other than the crew of a subgrantee that do not meet the cost effectiveness tests of energy efficiency investments.

Subgrantee Installed Materials
The cost of any action item or measure funded under this contract, as installed by the technicians employed by the Weatherization Assistance Program subgrantee, will be reimbursed with the exception of items listed under Health & Safety.

Subgrantee Installed Health & Safety Investments
Those materials and products installed by the subgrantee's technicians that do not meet cost effective energy investment tests.

Other Program Support Expenses
Costs incurred for postage, telephone lines & service, printing, copying, general office supplies, computer hardware and software acquisition. Building permits and fees necessary to the accomplishment of certain actions and investments upon a client dwelling unit.

Tools and Equipment
The acquisition of all tools and equipment whether expendable such as drill bits, sanding paper, or major investment like power tools, diagnostic equipment such as blower doors.

Training and Technical Expenses
Cost of travel and/or registration to approved meetings, conferences, training, workshops and cost of retaining Commerce approved trainers and consultants.

Weatherization
Weatherization Assistance Program.

Reimbursement Procedures

Reimbursement requests shall be submitted on a monthly basis. The request shall include the following reporting elements:

- Invoice
- Financial Status Report (FIN)

Reimbursement request will be processed for payment upon determination that all reporting elements have met Weatherization contractual requirements. If reimbursement requests that do not meet Weatherization contractual requirements, Commerce will provide a report listing areas out of compliance and remedies needed to bring request into compliance.

Reporting Procedure

Invoice shall include name of agency, reporting month, commerce contract number, funding source, and amount per funding source, signature, and date

Financial Status Report shall show per line item current expenditures of the reporting period as well as cumulative expenditures to date.

Invoice and Financial reports shall be mailed and received by Commerce on the twelfth (12th) working day of the month on or before 5:00 P.M. taking into consideration any State holiday.

Copies of all reports shall be mailed to:

Arizona Department of Commerce
Energy Office
1700 W. Washington, Suite 220
Phoenix, Arizona 85007

Applicant Reports shall be submitted in an electronic format. Reports shall include names and addresses of persons serviced, existing condition of unit, breakdown and totals for owner and rental units, different type of occupancy and on-site investment. Totals of applications pending shall be included.

For each dwelling unit completed, a set of data supporting work performed by funding source, to include Pressure Diagnostics and Combustion Safety results, shall be submitted.

PROGRAM ELIGIBILITY REQUIREMENTS

Eligible Population

Arizona's defines "low-income" for eligible purposes as follows:

- Income is at or below 150% of the federal poverty level determined in accordance with criteria established by the Office of the Secretary, US. Department of Health and Human Services.
- The household includes members who has received cash assistance payments under AFDC or SSI, are automatically eligible for Weatherization assistance.
- For income from Social Security Administration Benefits-SSA benefits (sometimes referred to as RSDI – retirement, survivors, and disability insurance) granted to eligible wages earners and/or their dependants or survivors. DO NOT INCLUDE THE MEDICARE DEDUCTION IN THE TOTAL AMOUNT

Certification of Income Eligibility

An authorized representative of the CONTRACTOR shall inspect at least one document from the following list of acceptable documents before certifying the program applicant household as being income eligible for Weatherization services available under this contract. Acceptable documents for purpose of this provision are the following:

AFDC, SSI, or General Welfare award letter or document, Social Security Statement of earnings, Income tax return for prior year. The income test period is for the twelve (12) months prior to the date of application for program benefits under this contract. Recertification of income eligibility is required if 180 days or more have elapsed from the initial application date, and Weatherization work has not commenced on the applicant's dwelling.

Priorities

Priorities shall be given to the following eligible populations:

- Elderly
- Handicapped
- High energy consuming housing

REQUIRED PROGRAM ANNOUNCEMENT

CONTRACTOR shall announce the availability of Weatherization services as provided by this contract.

The program announcement shall provide all potentially interested and income eligible families with an opportunity to apply for Weatherization assistance. The CONTRACTOR shall provide application services on an outreach basis to applicants who are unable to leave their residences due to a handicap or fear of assault.

The following types of program announcements will satisfy this contract stipulation:

1. Legal advertisement in a newspaper of general circulation in the contractor's service area.

2. Feature article, on receipt of a new Weatherization contract, by the CONTRACTOR in a newspaper of general circulation in contractor's service area.

3. Program flyer or handout announcing the additional program funds or program expansion.

CLIENT FILE REQUIREMENTS

Separate File

A separate file shall be maintained for each household receiving Weatherization assistance under the terms of this contract. The client file shall be retained by the CONTRACTOR for a minimum of five years and be available for inspection by representatives of Commerce with reasonable advance notification.

Program Application Form

The program application form shall make it clear to the Weatherization customer that the household is applying for Weatherization assistance. Funded in part or in whole by grant funds made available to the Arizona Department of Commerce from the following: U.S. Department of Energy (DOE), U.S. Department of Health and Human Services through the Arizona Department of Economic Security for their Low Income Home Energy Assistance Program (LIHEAP), and funds from Southwest Gas Low-Income Energy Conservation Program (SWG).

Fuel Information Release Form

A fuel information release form signed by the applicant to allow the CONTRACTOR or the Arizona Department of Commerce to obtain a utility history for all metered fuels purchased by the applicant household. Applicants who are on a "master metered" system are not required to sign the fuel information release form.

Rental Dwelling

As applicable, no rental dwelling may be weatherized under the terms of this contract unless written permission to perform itemized services is obtained from the owner of the rental unit or the owner's authorized agent. Said written permission is to be retained, along with such other agreements between the CONTRACTOR and the rental owner/agent, as part of the job record and client job file.

A. The fuel information release form shall be signed by the tenant of a rental dwelling prior to the inception of Weatherization services unless the dwelling is part of a master-metered complex in which case this provision does not apply.

B. The owner of the rental property or the owner's agent shall agree in writing not to raise the rental charge of said dwelling for a minimum period of one year from the date of completion of Weatherization services as a consequence of the Weatherization investment.

PROHIBITION AGAINST WEATHERIZATION SERVICES

Dwelling Units

- Dwelling units which are vacant or which are designated for acquisition or clearance by a federal, state, or local program within twelve (12) months from the date of scheduled weatherization shall not be provided Weatherization services under this contract.

- Dwelling units which are known to be for sale as evidenced by "For Sale" signs on the property, realtor listing and offering or classified advertisement, shall not be provided Weatherization services under this contract.

- Weatherization services, under this contract, are prohibited where the dwelling unit of an applicant household is located in a designated flood plain unless said dwelling unit is currently covered by flood insurance.

PRIOR WRITTEN APPROVAL REQUIREMENTS

No work shall proceed or items are purchased until the CONTRACTOR has received prior written approval from Commerce.

Prior Written Approval is required by the Energy Office on the following:

- All purchase lease or lease-purchase (in excess of one week) of vehicles.

- Out-of-state travel charged to contract budget.
- Weatherization training, program sessions, or workshops not sponsored by the Energy Office or DOE, and charged to Weatherization.
- Adjustments to line items in the contract budget
- CONTRACTOR enters into any subcontract.
- Purchase of modular storage building.
- Purchase of extended warranties for installed items on client homes.
- Proposed removal of moldy building structural materials or building contents.
- Low-Income Weatherization services are for existing residential buildings only. Services are not authorized for new additions or residences in varying stages of new construction or remodeling, or for garage/carport conversions in progress unless authorization is obtained in writing for said work by Commerce.
- Homes that have been weatherized and reported to Commerce for contract credit will not be accepted for additional Weatherization assistance unless the CONTRACTOR has been issued prior authorization in writing to proceed.
- Weatherization of master metered dwelling units or where the landlord pays the energy utility services.

INVENTORY

Within twelve working days of execution of this contract the CONTRACTOR shall submit a current list of all inventory available for use in Weatherization. This list shall include:

- Description of inventory, manufacturer's serial number, model number, national stock number, or other identification number
- Acquisition date
- Locations, use, and condition of inventory
- Unit acquisition cost
- Disposition data - date and method of disposal

CONTRACTOR shall submit an updated Program Materials Inventory list at the end of the program year. Inventory list shall include any inventory acquisition, disposition, and condition changes during the program.

Property

All inventories acquired by funds provided through Commerce contract become program property. Title to inventory acquired and defined under the contract may vest upon expiration of the contract provided all terms and conditions of the contract have been met. This is pursuant to Office of Management and Budget (OMB) Circular A-102, 600-432A.

The CONTRACTOR shall indicate Weatherization Program ownership, maintain reasonable control, and be responsible for the proper care and maintenance of all inventories acquired through a contract with Commerce. All inventories lost, stolen, rendered unusable, or no longer required for program operation shall be reported to Commerce within 5 working days.

When the contract is terminated, the disposition of all inventory acquired, with contract funds, shall be determined as follows:

1. Commerce may allow continued use of program inventory provided that a new contract is executed and the inventory continues to be used as originally intended.

2. Commerce may sell inventory to the CONTRACTOR, at fair market value, if the CONTRACTOR wishes to utilize the inventory for purposes other than for which it was acquired. Fair market value will be determined by Commerce.

3. Commerce may take possession of the inventory.

INSTALLATION MEASURES

All materials/measures installed shall be justified utilizing the Energy Audit Procedures established by Commerce.

ENERGY AUDIT PROCEDURE

The Weatherization Assistance Program (WAP) Energy Audit Procedure is to be used by all sub-grantees to gather, record and analyze data on structures. This data is to be used to deliver weatherization materials/measures in a fashion that protects the health and safety of the client, increase the durability of the structure, increases the comfort of the client and reduces the energy cost to the client in a cost effective manner.

The following audit activities must be completed on all homes utilizing WAP funds.

- A site audit is to be completed that records all of the relevant data on the structure that is needed to perform a cost effectiveness test.
- The Cost Effectiveness Procedure must be followed to determine cost effectiveness of potential weatherization materials/measures.
- The Pressure Diagnostic Procedure must be completed and the findings documented following the Reporting Procedures.
- A health and safety audit of the structures must be completed and the findings documented following the Reporting Procedures.
- A final inspection must be of the structure must be completed and findings documented following the Final Inspection Procedures.

COST EFFECTIVENESS PROCEDURE

WAP has incorporated a performance based energy audit procedure that focuses on optimizing investment in energy efficiency through a systems approach. To enable the WAP program to optimize the investment in energy efficiency, the following requirements have been established for the audit procedure:

- The energy audit procedure must determine that each weatherization material/measure is cost effective by ensuring the discounted savings-to-investment ratio (SIR) is greater or equal to one.
- The energy audit procedure must assign priorities among weatherization materials/measures in descending order of SIR and must account for interactions between architectural and mechanical measures.
- The energy audit procedure must ensure that the overall SIR for the entire package of materials/measures, including the cost of incidental repairs, is greater or equal to one. Incidental repairs are only allowed if they are necessary to make the installation of weatherization materials effective.
- Funds spent to abate energy related health and safety hazards do not need to be included in the preceding requirements. Funds can be spent to eliminate health and safety hazards when the elimination of the hazard is necessary before or because of the installation of weatherization materials.
- A waiver must be received from the Energy Office before the installation measures/materials that do not meet the Cost Effectiveness or Health and Safety Requirements established by the WAP program.

To determine the cost effectiveness of weatherization materials/measures, the contractor must use a computer audit approved by the Energy Office or an appropriate priority list for homes that meet the criteria contained in the list.

CLIMATE ZONES

Arizona Climate Zone used for the Cost Effective Priority Lists can be found at http://www.azcommerce.com/energy/weatherization.asp

FUEL SWITCHING

The Weatherization Assistance Program does not permit the general practice of fuel switching when replacing heating, cooling or water heating equipment. The changing or converting equipment using one fuel source to another will be considered on a limited case-by-case basis only.

A waiver must be received from the Energy Office prior to changing or converting equipment using one fuel source or another.

COST EFFECTIVENESS PRIORITY LIST FOR DETACHED HOUSING

CLIMATE ZONE 1

The priority list can be used to determine cost effective weatherization materials/measures for homes located in Climate Zone 1 (see Climate Zone map). The priority list is comprised of two housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Homes with Gas Heating

- Existing ceiling insulation of R-19 or less upgraded to R-38.
- Uninsulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Water heater wrap (where allowed).

Housing Type Two: Homes with Electric Resistance Heating

- Existing ceiling insulation of R-19 or less upgraded to R-38.
- Uninsulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR DETACHED HOUSING

CLIMATE ZONE 2

The priority list can be used to determine cost effective weatherization materials/measures for homes located in Climate Zone 2 (see Climate Zone map). The priority list is comprised of three housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Homes with Refrigeration Cooling (AC or Heat Pump)

- Existing ceiling insulation of R-19 or less upgraded to R-30.
- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Air Conditioners twenty years old or older upgraded with a minimum 13 SEER unit.
- Shade screens on all sun struck south, east and west windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Two: Homes with Evaporative Cooling Only and Electric Resistance Heating

- Existing ceiling insulation of R-11 or less upgraded to R-30.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Water heater wrap (where allowed).

Housing Type Three: Homes with Evaporative Cooling Only and Gas Heating

- Existing ceiling insulation of R-11 or less upgraded to R-19.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100 or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR DETACHED HOUSING

CLIMATE ZONE 3

The priority list can be used to determine cost effective weatherization materials/measures for homes located in Climate Zone 3 (see Climate Zone map). The priority list is comprised of four housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Homes with Refrigeration Cooling and Electric Heating (Heat Pump or Electric Resistance

- Existing ceiling insulation of R-19 or less upgraded to R-30.
- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Shade screens on all sun struck South, East and West windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Two: Home with Refrigeration Cooling and Gas Heating

- Existing ceiling insulation of R-19or less upgraded to R-30.
- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Shade screens on all sun struck south, east and west windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Three: Homes with Evaporative Cooling Only and Electric Resistance Heating

- Existing ceiling insulation of R-19 or less upgraded to R-30.

- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Water heater wrap (where allowed).

Housing Type Four: Homes with Evaporative Cooling Only and Gas Heating

- Existing ceiling insulation of R-11or less upgraded to R-30.
- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR DETACHED HOUSING

CLIMATE ZONE 4

The priority list can be used to determine cost effective weatherization materials/measures for homes located in Climate Zone 4 (see Climate Zone map). The priority list is comprised of three housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Homes with Refrigeration Cooling (AC or Heat Pump)

- Existing ceiling insulation of R-19 or less upgraded to R-30.
- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Air Conditioners twenty years old or older upgraded with a minimum 13 SEER unit.
- Shade screens on all sun struck south, east and west windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Two: Homes with Evaporative Cooling Only and Electric Resistance Heating

- Existing ceiling insulation of R-11 or less upgraded to R-30.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Water heater wrap (where allowed).

Housing Type Three: Homes with Evaporative Cooling Only and Gas Heating

- Existing ceiling insulation of R-11 or less upgraded to R-30.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR DETACHED HOUSING

CLIMATE ZONE 5

The priority list can be used to determine cost effective weatherization materials/measures for homes located in Climate Zone 5 (see Climate Zone map). The priority list is comprised of four housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Homes with Refrigeration Cooling and Electric Heating (Heat Pump or Electric Resistance

- Existing ceiling insulation of R-19 or less upgraded to R-30.
- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Shade screens on all sun struck east and west windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Two: Homes with Refrigeration Cooling and Gas Heating

- Existing ceiling insulation of R-19 or less upgraded to R-30.
- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Shade screens on all sun struck east and west windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Three: Homes with Evaporative cooling only and Electric Resistance Heating

- Existing ceiling insulation of R-19 or less upgraded to R-30.
- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Water heater wrap (where allowed).

Housing Type Four: Homes with Evaporative Cooling Only and Gas Heating

- Existing ceiling insulation of R-19 or less upgraded to R-30.
- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR DETACHED HOUSING

CLIMATE ZONE 6

The priority list can be used to determine cost effective weatherization materials/measures for homes located in Climate Zone 6 (see Climate Zone map). The priority list is comprised of three housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.

- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Homes with Refrigeration Cooling (AC or Heat Pump)

- Existing ceiling insulation of R-19 or less upgraded to R-30.
- Un-insulated frame walls upgraded with blown insulation.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Air Conditioners twenty years old or older upgraded with a minimum 13 SEER unit.
- Shade screens on all sun struck south, east and west windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Two: Homes with Evaporative Cooling Only and Electric Resistance Heating

- Existing ceiling insulation of R-11 or less upgraded to R-30.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Water heater wrap (where allowed).

Housing Type Three: Homes with Evaporative Cooling Only and Gas Heating

- Existing ceiling insulation of R-11 or less upgraded to R-19.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR MOBILE HOMES

CLIMATE ZONE 1

The priority list can be use to determine cost effective weatherization materials/measures for mobile homes located in Climate Zone 1 (see Climate Zone map). The priority list is comprised of one housing type with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Priority list for Mobile Homes

- Reflective roof coating.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Storm windows on single pane windows (installed cost of under $3 per square foot).
- Replacement of jalousie windows with dual pane windows (installed cost of under $18 per square foot).
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR MOBILE HOMES

CLIMATE ZONE 2

The priority list can be use to determine cost effective weatherization materials/measures for mobile homes located in Climate Zone 2 (see Climate Zone map). The priority list is comprised of three housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Mobile Homes with Refrigeration Cooling (AC or Heat Pump)

- Reflective roof coating.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Air Conditioners twenty years old or older upgraded with a minimum 13 SEER unit.
- Storm windows on single pane windows (installed cost of under $3 per square foot).
- Replacement of jalousie windows with dual pane windows (installed cost of under $8 per square foot).
- Shade screens on all sun struck south, east and west windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Two: Mobile Homes with Evaporative Cooling Only and Electric Resistance Heating

- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Storm windows on single pane windows (installed cost of under $3 per square foot).
- Replacement of jalousie windows with dual pane windows (installed cost of under $4 per square foot).
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Water heater wrap (where allowed).

Housing Type Three: Mobile Homes with Evaporative Cooling Only

- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Replacement of jalousie windows with dual pane windows (installed cost of under $4 per square foot).
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR MOBILE HOMES

CLIMATE ZONE 3

The priority list can be use to determine cost effective weatherization materials/measures for mobile homes located in Climate Zone 3 (see Climate Zone map). The priority list is comprised of three housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Mobile Homes with Refrigeration Cooling

- Reflective roof coating.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Storm windows on single pane windows (installed cost of under $3 per square foot).
- Replacement of jalousie windows with dual pane windows (installed cost of under $10 per square foot).
- Shade screens on all sun struck south, east and west windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Two: Mobile Homes with Evaporative Cooling Only and Electric Resistance Heating

- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Storm windows on single pane windows (installed cost of under $3 per square foot).
- Replacement of jalousie windows with dual pane windows (installed cost of under $10 per square foot).
- Water heater wrap (where allowed).

Housing Type Three: Mobile Homes with Evaporative Cooling Only and Fossil Fuel Heating

- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Replacement of jalousie windows with dual pane windows (installed cost of under $9 per square foot).
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR MOBILE HOMES

CLIMATE ZONE 4

The priority list can be use to determine cost effective weatherization materials/measures for mobile homes located in Climate Zone 4 (see Climate Zone map). The priority list is comprised of three housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Mobile Homes with Refrigeration Cooling (AC or Heat Pump)

- Reflective roof coating.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Air Conditioners twenty years old or older upgraded with a minimum 13 SEER unit.
- Storm windows on single pane windows (installed cost of under $3 per square foot).
- Replacement of jalousie windows with dual pane windows (installed cost of under $7 per square foot).
- Shade screens on all sun struck south, east and west windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Two: Mobile Homes with Evaporative Cooling Only and Electric Resistance Heating

- Reflective roof coating.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Storm windows on single pane windows (installed cost of under $3 per square foot).
- Replacement of jalousie windows with dual pane windows (installed cost of under $4 per square foot).
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Water heater wrap (where allowed).

Housing Type Three: Mobile Homes with Evaporative cooling only and Fossil Fuel Heating

- Reflective roof coating.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Replacement of jalousie windows with dual pane windows (installed cost of under $4 per square foot).
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR MOBILE HOMES

CLIMATE ZONE 5

The priority list can be use to determine cost effective weatherization materials/measures for mobile homes located in Climate Zone 5 (see Climate Zone map). The priority list is comprised of two housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Mobile Homes with Refrigeration Cooling

- Reflective roof coating.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Storm windows on single pane windows (installed cost of under $3 per square foot).
- Replacement of jalousie windows with dual pane windows (installed cost of under $11 per square foot).
- Shade screens on all sun struck east and west windows and glass doors.
- Water heater wrap (where allowed).

Housing Type Two: Mobile Homes with Evaporative Cooling Only

- Reflective roof coating.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Storm windows on single pane windows (installed cost of under $3 per square foot).
- Replacement of jalousie windows with dual pane windows (installed cost of under $10 per square foot).
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

COST EFFECTIVENESS PRIORITY LIST FOR MOBILE HOMES

CLIMATE ZONE 6

The priority list can be use to determine cost effective weatherization materials/measures for mobile homes located in Climate Zone 6 (see Climate Zone map). The priority list is comprised of two housing types with a listing of cost effective upgrades.

A computer audit is required if:

- There are potential cost-effective energy upgrades to the house that are not listed on the priority list or the General Waste Heat Items list.
- There are not sufficient funds to complete all the measures; including energy related health and safety measures and other energy related repairs.
- Energy related incidental repairs of more than $100 are included with the energy upgrades.

Housing Type One: Mobile Homes with Refrigeration Cooling (AC or Heat Pump)

- Reflective roof coating.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Air Conditioners twenty years old or older upgraded with a minimum 13 SEER unit.
- Shade screens on all sun struck south, east and west windows and glass doors.
- Storm windows on single pane windows (installed cost of under $3 per square foot).
- Replacement of jalousie windows with dual pane, windows (installed cost of under $8 per square foot).
- Water heater wrap (where allowed).

Housing Type Two: Mobile Homes with Evaporative Cooling Only

- Reflective roof coating.
- Pressure diagnostics and repair following the pressure diagnostic procedure established by the WAP program.
- Replacement of jalousie windows with dual pane windows (installed cost of under $3 per square foot).
- Upgrade of evaporative cooler motor with higher efficiency two-speed motor.
- Water heater wrap (where allowed).

In cases where there are potential cost effective energy upgrades not listed, incidental repairs of more than $100, or sufficient funds are not available to complete **all** (energy, health and safety and energy related repairs) possible upgrades, a computerized audit must be completed to develop a ranking of the energy upgrades, based on their SIR. Only those measures with a SIR of one or greater can be completed. If sufficient funds are not available to complete all possible upgrades, those upgrades with the highest SIR must be completed first.

GENERAL WASTE HEAT ITEMS

ALLOWABLE MEASURES WHICH DO NOT REQUIRE A COST EFFECTIVENESS TEST

Domestic Hot Water

- Adjustment of the hot water temperature to 120 degrees if approved by the client.
- Replacement of existing showerhead, which exceeds a flow rate of 2.5 GPM, with a low-flow replacement showerhead if approved by the client.
- Faucet aerators

Space Heating and Cooling Systems

- Equipment maintenance and tune-up.
- Heating or Cooling System setback thermostat(s) for people with mobility problems or other extenuating circumstances, which make it difficult for them to manually adjust thermostat set points.

Existing Evaporative Coolers

- General evaporative cooler tune-ups.
- Replacement of a single speed evaporative cooler motor with a listed two-speed motor.

MEASURES THAT CAN BE FUNDED WITH LIHEAP WAP

- Replacement Hot Water Tanks: Gas fired tanks shall have R-8.3 minimal sidewall insulation. Electric tanks shall have R-11 minimal sidewall insulation.
- Exterior doors.
- Attic ventilation.
- Replacement of wall, ceiling, and floor forced air supply registers when existing condition limits functioning of control louvers.

BASE LOAD ITEMS

ALLOWABLE MEASURES WHICH DO NOT REQUIRE A COST EFFECTIVENESS TEST

- Replacement of incandescent light bulbs, which are on for at least one hour per day, with an ENERGY STAR qualified compact fluorescent bulbs that emit the same amount of light.
- Refrigerators replacement. All replacements must follow the Refrigerator Replacement Policy.

Window Replacements

- Replacements must meet the energy star performance criteria (www.energystar.gov)

PRESSURE DIAGNOSTIC PROCEDURE

The pressure diagnostic procedures are to be followed when performing air leakage diagnostics and repair. These procedures provide crews with immediate feedback on the effectiveness of air sealing work, insure that repairs will provide long-term energy benefit in a safe manner, and provide essential management information needed to monitor the cost effectiveness of the air sealing programs.

Pressure Diagnostic Decision Tree

The pressure diagnostic decision tree provides assistance to agency personnel in identifying the minimum level of pressure testing that needs to be performed to meet the Weatherization Program requirements. The decision tree is comprised of two levels of housing characteristics and corresponding test requirements. In all cases, air sealing can only be performed in conjunction with pressure diagnostics.

Level One: Homes with Central Forced Air Heating or Cooling.

- The **complete** pressure diagnostic process must be followed in all cases on homes with a central forced air heating or cooling system. (Evaporative cooling is not considered a forced air system in this case.)

Level Two: Homes with No Central Forced Air Heating or Cooling

- The use of pressure diagnostic process is **optional** in homes that do not have a central forced air heating or cooling system and that do not contain the characteristics listed below.

    - **Possible cost effective envelope sealing:** Pressure diagnostics must be completed on homes where the cost of space heating and/or cooling provides possible cost effective envelope sealing opportunities.
    - **Combustion appliance zone testing:** The Worst Case Pressure Test must be performed in **all** zones that contain a combustion appliance.

Testing Procedure

When performing pressure diagnostic, crews are required to use the following procedures **IN SEQUENCE**. If a test is not performed, document must be provided in all cases stating the rational for not following the testing procedure.

1. Initial air leakage and room pressure tests
2. Duct repair
3. Envelope air sealing
4. Room pressure balancing

1. Initial Air Leakage and Room Pressure Tests:

These initial tests will provide reference information on the existing condition of the home. This information will be used to determine what retrofit measures are to be completed and their effectiveness.

A. Perform a complete energy audit and combustion safety test of the house. **No pressure testing or air sealing can be done until the required combustion safety procedure is completed.**

B. Perform Room Pressure Tests (dominant duct leakage test, room pressure test, and combustion appliance zone [CAZ] test) and record pressures. List combustion appliances located in rooms tested. **If a pressure of –3 Pascals (Pa) or more exists in a CAZ, or the possibility exists that repair work will create a pressure of –3 Pa or more in a CAZ, corrective action must be completed before or in conjunction with air sealing or duct repair.** Discuss possible corrective action with the client. **If client refuses to allow corrective action to be completed**, no air sealing or duct repair can be completed.

C. Perform zonal pressures and record the results.
D. Perform initial Whole House CFM50 Test and record the results.
E. Perform Pressure Pan Test and record initial pressure difference.
F. Based on the results of the energy audit, combustion safety tests, and pressure tests, determine the extent of work to be completed.

2. Duct Repair Procedure:

A. Duct repair can only be performed under the supervision of a trained technician.
B. The Health and Safety Policy must be followed at all times.
C. Perform duct repair using approved products (see Product Guidelines) and repair techniques (see Duct Repair Techniques).
D. After initial duct repair is performed, evaluate if additional duct repair is possible.
E. Once all attainable duct leakage is repaired, perform post duct repair Whole House CFM50 Test and pressure pan readings. The difference between the initial Whole House CFM50 Test and the post duct repair Whole House CFM50 Test will provide the CFM reduction in duct leakage.

3. Envelope Air Sealing Procedure:

A. All duct repairs must be completed before envelope air sealing.
B. Envelope air sealing can only be performed under the supervision of a trained technician.
C. The Health and Safety Policy must be followed at all times.
D. Perform air sealing with high-quality products. Weatherization products must be permanent and guaranteed for at least 15 years.
E. Repeat Whole House CFM50 Test after air sealing work is performed and evaluate if additional air sealing is possible (see Health and Safety Policy for CFM ventilation requirements).
F. Once air sealing is completed, perform final Whole House CFM50 Test and record results.

4. Room Pressure Balancing:

A. All duct repair and air sealing must be completed before room pressure balancing.
B. Room pressure balancing can only be performed under the supervision of a trained technician.
C. The Health and Safety Policy must be followed at all times.
D. Perform post air sealing room pressure tests (dominant duct leakage test, room pressure test, and worst case test) and record room pressures.
E. Review options to remedy pressure imbalances with the client. If pressure balancing is not performed, record reasons in the work summary.
F. Repeat room pressure tests after initial pressure balancing measures are installed and evaluate if addition pressure balancing is needed.
G. Once pressure balancing is completed, repeat room pressure tests and record results.

Economics

The cost effectiveness of pressure diagnostic and repair is to be based on a comparison of the present value of the reduced air leakage and the cost (labor and materials) to achieve the reduction. The values in the following tables are designed to provide general guidance on the present value of air leakage control.

Infiltration

The following table gives the present value of reducing the infiltration rate by 100 CFM50 for a typical weatherized home.

Present value of 100 CFM50 reduction	Climate Zone 1	Climate Zone 2	Climate Zone 3	Climate Zone 4	Climate Zone 5	Climate Zone 6
	$160	$40	$90	$40	$90	$40

Duct Leakage

The following table gives the present value of reducing duct leakage by 100 CFM50 for a typical weatherized home.

Present Value of 100 CFM reduction	Climate Zone 1	Climate Zone 2	Climate Zone 3	Climate Zone 4	Climate Zone 5	Climate Zone 6
Heating	$800	$90	$345	$95	$385	$50
Cooling*	$10	$450	$80	$300	$100	$870

*If a home has only evaporative cooling, only the heating values will be realized in duct repair.

COMBUSTION SAFETY PROCEDURES

The Combustion Safety procedure records data on combustion appliances in the house, possible health and safety issues with these appliances and the actions taken by the Weatherization program. Because combustion appliances can be the dominant factor in the health and safety of the occupants, it is imperative that the combustion safety procedures are followed in all cases.

Gas Leaks

All gas appliances and plumbing must be checked for possible leaks. List any problems found.

Indoor Carbon Monoxide levels

Tests must be completed on the amount of Carbon Monoxide, in parts per million (PPM), found in the ambient indoor air during appliance operation. An initial test must be performed in every space that contains a combustion appliance and in one supply vent for combustion forced air furnaces. The test must be repeated if an appliance is serviced or replaced.

Flue Carbon Monoxide levels

Tests must be completed on the amount of Carbon Monoxide, in PPM, found in the undiluted flue gases of combustion appliances at steady state. An initial test must be performed on every combustion appliance. The test must be repeated if an appliance is serviced or replaced.

Combustion Air

Combustion air requirements, as prescribed in NFPA 54 or local gas codes, must be met on all homes with combustion appliances.

The Kbtu per hr input for heating and water heating equipment must be listed. If Kbtu per hr information is not available, state this fact and estimate input.

The location of all heating and water heating equipment must be listed.

The source and amount of combustion air for all heating and water heating equipment must be listed. For appliances that are using an interior space for combustion air, the cubic feet available is determined by the volume (area times height) of the space. Areas that can be isolated and the flow of air restricted from the combustion appliance are not to be included.

Heat Exchanger Safety Checks

Tests for possible cracked heat exchanger must be performed on all systems possible.

Draft Test

Test must be completed on the draft, measured in Pascal's, created in the flue during appliance operation. This test must be performed on atmospheric (appliances with a draft diverter) appliances. Appliance must draft within one minute of ignition. Do not drill sealed combustion or power exhaust appliances.

Spillage Test

Test must be performed on atmospheric (appliances with a draft diverter) appliances. Appliance must draft within one minute of ignition.

FINAL INSPECTION REQUIREMENTS

A final inspection shall be performed on all jobs.

The final inspection shall verify that the house characteristics reported are correct.

The inspection shall verify that all cost effective opportunities were completed.

The inspection shall include all measures listed on the Work Performed report to verify installation has been completed in a safe and effective manor.

The inspection shall include a review of the diagnostic result, both pressure and combustion safety, to verify that all applicable tests were completed. The inspector should complete diagnostics on a sampling of homes to compare with reported results.

HVAC EQUIPMENT AND DISTRIBUTION INSTALLATION/REPAIR POLICY

The following policy must be strictly adhered to when installing or repairing HVAC equipment and distribution systems.

Repair/Replacement

In determining if non-functional equipment will be repaired or replaced, the following factors are to be considered.

- Cost of repair
- Incremental cost of replacement
- Present value of savings resulting from new equipment
- Projected life of repaired equipment

If the present value of savings resulting from the new equipment is greater then the incremental cost of replacement, the equipment can be replaced. If the present value of savings resulting from the new equipment is less then the incremental cost of replacement, the equipment should be repaired.

Replacement of the equipment is also justified if there is a high probability that the repaired equipment will fail again in the near term.

Sizing & Installing HVAC Equipment

- Minimum HVAC efficiencies:
  - AC: 13 SEER
  - Heat Pump: 13 SEER and 7.7 HSPF
  - Combustion furnace: 80% AFUE.
- New mechanical systems shall be sized according to the ACCA Manual J. Room-by-room load calculations using the ACCA Manual J shall be submitted for each plan to verify sizing.
- Airflow across the indoor coil and/or heat exchanger shall conform to the manufacturer's specifications.
- Refrigerant charge shall be installed per the manufacturer's specifications.
- Indoor and outdoor units shall be "matched" according to the ARI Directory.

Evaporative Cooler Installation

It is strictly prohibited to install a new evaporative cooler on the ductwork of a forced air heating or cooling system.

All existing evaporative coolers must be equipped with a damper system that allows the cooler to be isolated from forced air ductwork or the conditioned space.

Installation of Forced Air Distribution Systems

- All new ductwork must be installed according to the Duct Installation/Repair Techniques and Product Guidelines.
- All duct systems must be pressure tested and the CFM leakage rate cannot exceed 3% of conditioned sqft or 5% of high speed fan flow of the systems air handler capacity.
- Airflow to each room shall match designed airflow calculations from the ACCA Manual J to within +/- 10%.

Repair of Existing Air Distribution Systems

All ductwork must be repaired according to the Duct Installation/Repair Techniques and Product Guidelines.

Duct Installation/Repair Techniques

A. Flex ducts

- Seal the start collar to the plenum using mastic reinforced with mesh around the entire circumference.
- At all connections (triangles, junction boxes, etc.), fasten the inner liner to the start collar using a mechanically tightened draw band for mechanical strength.
- Seal the inner liner using approved mastic reinforced with fiberglass mesh and overlaid with another layer of mastic sufficient to cover the entire pattern in the mesh.
- Fasten the outer liner well over the start collar using a mechanically tightened draw band.
- Seal all boots to the Sheetrock using mastic or silicone caulk applied at the point where the air barrier (metal or exterior foil backing) meets the Sheetrock.

B. Duct board

- Staple all duct board joints with appropriate staples every two inches.
- Apply a layer of mastic; embed reinforcing mesh and overcoat with another layer of mastic sufficiently thick to hide the pattern in the tape.
- Allow for proper curing (manufacturer's specifications) before starting the system. This is critical.
- Seal all boots to the Sheetrock at the point where the foil backing meets the Sheetrock.

C. Metal

- Seal all points where components join together using mastic. Special attention must be given to any area where tabs provide the method of securing the joint.
- Seal all boots to the Sheetrock at the point where the metal meets the Sheetrock.
- Join all components with screws or other mechanical fastening devices as required in listings or code.

D. Building Cavities Used as Returns

- If the cavity is lined with Sheetrock, seal all joints with mastic. All gaps over 1/4 inch must be reinforced with embedded mesh tape.
- If the cavity is lined with duct board with the fiberglass side facing inside, you must create a positive air barrier in the plenum by covering the fiberglass with a material such as Sheetrock, duct board with the foil facing inside, or coat the fiberglass with mastic, etc., and seal all remaining joints in the plenum.
- If the cavity is unlined (exposed studs) and it is impossible to line the plenum, seal all joints, holes and penetrations using mastic applied with a brush attached to a handle or other extension. It may be easier and more effective to simply create a ducted plenum or chase and avoid the problems associated with using a building cavity to convey conditioned air.
- It may be necessary to cut a hole in the plenum in order to gain access and seal the interior adequately.

E. Air Handler

- Seal all penetrations and gaps between materials using mastic or silicone. If the gap is over ¼ inch, reinforce with fiberglass mesh.
- Seal the areas where the air handler meets the supply/return plenums using mastic reinforced with fiberglass mesh or other approved methods.
- Seal any panels that will require frequent access by the client (such as the filter area), using a quality temporary tape (duct tape).
- The air handler must not have any noticeable leaks.

F. Wall Penetrations

(The most common wall penetration problem is where the opening for the return grille is cut through the wall. In such an installation, even in a lined plenum, the wall cavity is open into the plenum.)

- Where an un-ducted section of the air distribution system penetrates a wall cavity, the wall cavity must be sealed.
- The cavity will first be blocked using a rigid air barrier such as Sheetrock or duct board with the foil facing the airflow.
- All seams, cracks, crevices, and openings will then be sealed airtight using approved mastic.

PRODUCT GUIDELINES

- All new ductwork will be a minimum of R-6.
- Duct sealing materials shall have both excellent cohesive and adhesive qualities.
- Water-based Latex mastic with at least 50 percent solids reinforced with fiberglass mesh at all duct connections, joints and seams shall be used. "Hardcast" type mastic with reinforcing mesh is also acceptable.
- The ducts shall be further attached as per manufacturer's specification, using a draw tie, plumbing strap or screws, as appropriate for a strong mechanical connection. The mechanical connection **does not** replace air sealing.
- Foil tapes, including UL 181 AP-type tapes, when used alone will not be accepted. If tape is used to temporarily hold a seam, it must be overlaid with a coating of mastic that extends at least one inch (1") past the tape on all sides, and is thick enough to hide the tape completely.
- Do not use materials that are potentially damaging or have harmful effects, such as toxic vapors or carcinogenic substances that may be harmful to the clients or the installer. Agencies are required to obtain and maintain the Material Safety Data Sheets (MSDS) for all materials used on the job. Federal law requires this procedure; further information is available locally from the vendor.
- Materials must meet all current codes and manufacturer's specifications.

Low Income Weatherization Program

HEALTH AND SAFETY PLAN

PURPOSE

To establish the policies and procedures under which health and safety concerns are addressed in the Weatherization Assistance Program (WAP).

GOAL

To ensure energy savings are the result of Weatherization Assistance Program actions while promoting a healthy and safe environment for clients and WAP workers and contractors.

SCOPE

Energy-related health and safety concerns need to be remedied before, or because of, the installation of weatherization materials. Therefore, energy-related health and safety hazards associated with weatherization activities may be remedied or prevented with DOE funds. Measures and their costs must be reasonable and must not seriously impair the primary energy conservation purpose of the program.

The Health and Safety Procedures are applicable to all activities under the WAP.

A. Grantee Health & Safety

The Arizona Energy Office – WAP field monitors will follow all applicable health and safety rules with respect to the conduct of their on-site job visits including the use of face masks, hard hats, appropriate footwear, and such other applicable attire and equipment so as to minimize personal risks.

B. Crew and/or Contractor Health & Safety

Arizona Sub grantees and their contractors will comply with Occupational Safety and Health Administration (OSHA) requirements in all weatherization activities.

The costs for Sub grantees to comply with OSHA requirements (action items & measures that DOE funds and receives credit for) may be charged under health and safety, tools and equipment, incidental repairs, etc. The cost category selected will be charged consistently throughout the state (from agency to agency) for the same activity.

Because of the wide range of activities involved in weatherizing a house, ensuring crew health and safety requires a broad knowledge of the appropriate OSHA requirements. Some of these requirements include, but are not limited to: respirator protection, techniques for safely lifting heavy objects, electrical equipment safety, ladder safety, and general worker protection. OSHA standards should be consulted for further details.

Other useful information includes Material Safety Data Sheets (MSDS) that identify potential health risks and describe the proper use, handling, and storage of a wide variety of materials, including some common weatherization materials. MSDS also recommend personal protective equipment and address first aid measures.

C. Client Health and Safety

Weatherization services can be provided in a manner that minimizes risk to workers and clients. Although the Weatherization Assistance Program does not provide all the solutions, awareness of potential hazards is essential to providing quality services. A list of the more common hazards and DOE's preferred approach to them are discussed in Section D. Other energy-related hazards should be considered on a case-by-case basis

Grantees and subgrantees are required to take all reasonable precautions against performing work on homes that will subject workers or clients to health and safety risks. If there is any doubt that weatherization work can be conducted in a manner that is safe for all parties concerned, the Subgrantee must not proceed further.

Before beginning work on the residence, Subgrantees will take into consideration the health concerns of each occupant, the condition of the dwelling, and the possible effect of work to be performed on any particular health or medical condition of the occupants. When a person's health is fragile and/or the work activities would constitute a health or safety hazard, the occupants at risk will be required to leave the home during these work activities or the work will be suspended until such a time as it can be performed appropriately.

D. Potential Hazard Considerations

1. Biologicals

Removal of mold, odors, viruses, bacteria, unsanitary (including raw sewage) conditions, and rotting wood is not a Weatherization responsibility; however, Subgrantees frequently encounter these conditions. DOE funds may be used if these conditions must be remedied to allow effective weatherization work and/or to assure the immediate or future health of workers and clients. The Arizona Energy Office – WAP requires that its Subgrantees seek prior approval to proceed before attempting to weatherize such dwellings with *Biological* problems.

Arizona Subgrantees will exercise caution when selecting air tightness limits for dwellings with these problems. Since these conditions are often related to moisture, Arizona subgrantees may use DOE health & safety funding to acquire moisture detection instruments. Subgrantees should incorporate moisture detection into their initial energy audits. If necessary, weatherization services may need to be delayed until moisture problems can be corrected by other funding sources.

2. Combustion Appliances and Combustion Gases

The following policy must be strictly adhered to when completing Weatherization work. If any house fails these program safety standards and the problem cannot be remedied, the homeowner must be notified in writing and a copy placed in the client's file.

- Perform air sealing and duct repair **only** in conjunction with pressure diagnostics to ensure that sufficient ventilation and draft rates are maintained in the home.
- A UL listed carbon monoxide detector (Underwriters Laboratories 2034-98) shall be installed in all structures with an attached garage or a combustion appliance located in the conditioned space.
- Research and follow the local health and safety codes and standards dealing with residential ventilation requirements for occupants and combustion equipment.
- No air sealing (including duct repair) should be done if there is a high pollution source, such as a non-vent combustion heater, that can't be removed.
- No air sealing (including duct repair) should be done if there are existing health and safety problems in the home.
- No air sealing (including duct repair) should be done if there is Carbon Monoxide (CO) present in the flue gases higher than 100 PPM.
- No air sealing (including duct repair) should be done if there is a possible gas leak.
- No air sealing (including duct repair) should be done if CO is greater than 9 PPM in the living space.
- If CFM50 is less than 1500 CFM for the home or 300 CFM per person (whichever is greater), the homeowner must be advised of the tightness of the home. Any further air sealing (including duct repair) may require that an active ventilation strategy be employed.
- Under normal operating conditions, an air handler cannot create room pressures with a magnitude of - 3.0 Pascals, or greater with reference to outside, anywhere in a combustion appliance zone.
- Corrective action must be completed before or in conjunction with air sealing (including duct repair) if a negative pressure of 3 pascals or greater exists or is produced by repair work in a combustion appliance zone.

- Flame change is an indication of a cracked heat exchanger - no air sealing (including duct repair) should be done until the problem is fixed.

- If spillage of flue gases occurs for more than one minute - no air sealing (including duct repair) should be done until the problem is fixed.

- If draft is low, it must be fixed before air sealing (including duct repair) is completed.

Minimum draft pressures required as follows:

Outside temperature below 20° F, -5.0 pascals draft
Outside temperature 20° to 40° F, -4.0 pascals draft
Outside temperature 40° F to 60° F, -3.0 pascals draft
Outside temperature 60° F to 80° F, -2.0 pascals draft
Outside temperature above 80° F, -1.0 pascals draft

IF THE CONDITIONS DESCRIBED BELOW CONCERNING COMBUSTION AIR ARE NOT MET, NO AIR SEALING (INCLUDING DUCT REPAIR) SHOULD BE DONE:

- In homes of ordinary tightness insofar as infiltration is concerned, all or a portion of the air for fuel-burning appliances may be obtained from infiltration when the requirements for 50 cubic feet per 1000 Btu/hr input is met. Two openings are required and one shall be within 12 inches of the bottom of the space containing the combustion equipment. Openings shall allow space to communicate with the rest of the house. A minimum free area of one square inch per 1000 Btu per hour (or 100 square inches, which ever is greater) of the total input rating of all gas utilization equipment in the space, shall be provided.

- In all cases where combustion air is from inside the home, the homeowner must be made aware of this and sign the Health and Safety Waiver before any air sealing or duct repair is completed.
(**Note:** If this method is used, special attention must be given to zonal and draft pressures. In buildings of unusually tight construction, combustion air shall be obtained from outside.)

- In homes that receive combustion air from outside the conditioned space, two openings are required. One shall be within 12 inches of the top and one within 12 inches of the bottom of the space containing the combustion equipment. The openings shall communicate directly, or by ducts, with the outdoors or spaces (crawl or attic) that communicate with the outdoors.

- The following guidelines must be met when determining the minimum free area for combustion air openings:

    - Openings directly communicating with the outdoors shall provide one square inch per 4000 Btu per hour of the total input of all gas utilization equipment in the space.

    - Openings communicating to outdoors with vertical ducts shall provide one square inch per 4000 Btu per hour of the total input of all gas utilization equipment in the space.

    - Opening communicating to outdoors with horizontal ducts shall provide one square inch per 2000 Btu per hour of the total input of all gas utilization equipment in the space.

(**NOTE:** If the free area is not known because of louvers or screens, double the required opening size. **IF THESE NFPA 54 NATIONAL FUEL GAS CODE REQUIREMENTS ON COMBUSTION AIR ARE NOT MET,** THEN NO AIR SEALING (INCLUDING DUCT REPAIR) SHOULD BE DONE UNTIL THESE CONDITIONS ARE MET.)

3. Fire Hazards

Combustion appliances and their associated venting systems can also present potential fire hazards. Subgrantees that accept clients with wood stoves and fireplaces will have procedures to identify potentially dangerous creosote build-up in chimneys and wood stove flues.

It is the Subgrantee's responsibility to ensure that any work on wood stoves and fireplaces conforms with applicable codes in jurisdictions where the work is being performed.

4. Existing Occupant Health Problems

Subgrantees will be sensitive to client health problems that might be exacerbated by weatherization activities.

Subgrantees will establish procedures to identify pre-existing client conditions (e.g., allergies) and address such problems when they are found. Those procedures should address the manner in which such problems will be identified and the steps to be taken to ensure that weatherization work will not worsen these problems.

5. Indoor Air Quality (IAQ)

a. Asbestos

General asbestos removal is not approved as a DOE WAP health and safety weatherization cost.

Major asbestos problems should be referred to the Arizona Department of Environmental Quality or to the Environmental Protection Agency (EPA).

Where local agencies work on large heating and distribution systems, including related piping, asbestos removal may be necessary. Removal is allowed to the extent that energy savings resulting from the measure will provide a cost-effective savings-to-investment ratio. This would normally be true with work done on large, multifamily heating systems. Where permitted by code or EPA regulations, less costly measures that fall short of asbestos removal, such as encapsulation, may be used. Removal and replacement of asbestos siding for purposes of wall cavity insulation is permissible if allowed by state and local codes.

b. Radon

Where there is a previously identified radon problem, work that would exacerbate this problem should be limited. Radon abatement is not an allowable activity under the Weatherization program. However, those costs associated with taking precautions in a dwelling known to have radon problems are allowable weatherization expenditures. These costs are allowable if an energy audit indicates that weatherization techniques would help in radon remediation. While Subgrantees should establish sound radon-related strategies, major radon problems should be referred to the appropriate local environmental organization or agency for mitigation or abatement.

c. Formaldehyde and Volatile Organic Compounds (VOCs)

Formaldehyde vapors may be slowly released by some new carpets, wafer-board, plywood, etc. Some household cleaning agents also emits VOCs.
Caution should be taken when selecting air tightness limits in dwellings with VOC problems.

6. Lead Paint

In May 2001, the Weatherization Assistance Program (WAP) issued Program Notice 01-10, Weatherization Activities and Federal Lead-Based Paint Regulations. This document and its attachments lay out the requirements for Arizona's sub-grantees and their contractors to follow when working in homes with lead-based paint.

Lead-based paint dust and other residues are hazards that Weatherization workers are likely to encounter in older homes. HUD estimates that four million homes have significant lead-based paint hazards. Furthermore, some Weatherization work (working with older wood sash windows) may directly disturb lead-based paint, possibly creating hazardous conditions. Arizona's WAP policy is that Weatherization workers must be aware of the hazard and conduct Weatherization activities in a safe work manner to avoid contaminating homes with lead-based paint dust and debris, and to avoid exposing the occupants, themselves and their families to this hazard. The protocols used to safe guard people from lead-based paint hazards are called Lead Safe Weatherization (LSW).

ARIZONA'S LEAD SAFE WEATHERIZATION PROTOCOLS

LSW is a set of protocols to be used when disturbing surfaces that may have lead-based paint, that will reduce and control the amount of lead dust and paint chips that are generated. Arizona has adopted the protocols developed by the Montana State University. These protocols are attached or the curriculum is available for review on the WAPTAC website **www.waptac.org.**

When is LSW necessary.

Local sub-grantees will use the following set of criteria for determining when LSW would be performed:

- The dwelling was constructed pre-1978, and
- The dwelling has not been determined to be lead-based paint free, and
- Either, the amount of disturbed lead-based painted surface exceeds two square feet per room of interior surface, twenty square feet of exterior surface, or 10 percent of a small component type, e.g., window; or the amount of lead-based paint dust that will be generated by the Weatherization work exceeds the OSHA-defined airborne levels for lead.

Testing for lead-based paint and lead-based paint residues.

Testing for lead-based paint is not an allowable weatherization expense except, when it is related to the installation of energy efficiency measures. These expenditures must be within the limits set by the state in its Weatherization health and safety plan.

In pre-1978 houses where the presence or absence of lead-based paint has not been determined, testing for lead-based paint could be worthwhile as an economy step. If the anticipated weatherization/energy efficiency work involves disturbing more than a small amount of painted surfaces, then ruling out the presence of lead in the paint would save extra time and costs associated with doing LSW practices. Testing in a home for lead in a painted surface, when it is done, is limited to only those surfaces that will be disturbed.

The following considerations are offered as a guide to determining whether testing is worth the time and money on a case-by-case basis:

- Houses (including mobile homes, and apartments) built from 1978 on may be assumed to be free of lead-based paint, without testing.
- In houses (including mobile homes, and apartments) built prior to 1930, it is logical to simply assume the presence of lead-based paint and save the cost of testing.
- In homes built between 1930 and 1978, testing may not be warranted if the amount of paint to be disturbed is small, since it may be cheaper to perform LSW for a small area than to incur the expense of testing. However, where the amount of paint to be disturbed is relatively large, it may be worth the cost of testing, since a negative result would mean that the crews could dispense with having to perform the LSW protocols.

Routine testing of every house for lead paint levels before the start of work (testing of painted surfaces to be disturbed and/or risk assessment) and at the end (clearance testing) is a standard practice associated with lead paint hazard control or abatement work and is not an allowable use of DOE Weatherization funds, except as required when weatherization work is being done on HUD homes or with HUD funds. If a sub-grantee establishes a regimen of routine risk assessment and clearance testing for all cases where the presence of lead paint is a possibility, the sub-grantee must use other sources of funding to implement such a policy.

NOTE: **HUD's guidance to its properties has been to test all properties for the presence of lead-based paint; so, the HUD program housing in your area may already have been tested for lead-based paint.**

About Clearance Testing - Clearance testing (as required by the HUD Rule) is not a requirement for Weatherization work per se. **As such, clearance testing is not an allowable expenditure of DOE funds.**

However, under some circumstances, clearance testing may be required if you are doing Weatherization work in HUD program housing or you are using HUD funds. In these instances, your first course of action should be to ask the HUD program to fund the additional cost for LSW and clearance testing. If no HUD funds are available, DOE funds may be used for clearance testing since it is a requirement in this instance.

Arizona subgrantees must seek prior approval in every instance before DOE WAP funds will be approved for clearance testing in allowable *special situations* involving HUD housing.

Deferrals

Arizona's WAP sub-grantees will follow the lead-based paint "deferral policy" to determine when it is prudent to defer certain Weatherization work in homes that have either tested positive or are assumed to have lead-based painted surfaces.

- First, the subgrantee should assess the following factors:

  1) Is the subgrantee prepared to work with lead-based paint? (i.e., have workers received training in LSW work practices - is the necessary equipment, such as HEPA vacuum cleaners, available; and does the agency's liability insurance cover work with lead-based paint);

  2) What is the condition of the painted surfaces in the house that might be specifically disturbed in the course of an allowable weatherization measure? (i.e., are they *seriously* deteriorated);

  3) What is the extent to which the specific energy efficiency measures determined by the audit will disturb painted surfaces? (i.e., will the disturbance likely generate dust in excess of OSHA minimums); and,

  4) Will the cost of doing LSW work represent a large portion of the total cost, such as to exceed the amount allowed by the state's health and safety plan (which could be the case if large amounts of lead-based paint surfaces will be disturbed)?

- Second, the grantee should determine, based on consideration of the above factors, whether to:

  1) proceed with all the weatherization work, following LSW work practices; or
  2) Do some of the weatherization tasks, defer others; or
  3) Defer all the weatherization work

  Deferral would mean postponing the work either until the Weatherization agency is prepared to work with lead-based paint, or until another funding source has been identified that can finance corrections to the problem LPB area that weatherization can be safely performed.

  In cases where extensive LSW would be necessary, agencies are encouraged to arrange with other organizations, which are funded to do lead-based paint hazard control, to perform some of the more costly activities, such as risk assessment or clearance testing.

  In areas where there are no organizations performing such work, Weatherization agencies may choose to develop their capabilities (purchase of equipment and advanced training for subgrantee crews) for lead-based paint hazard control work, but they may not use DOE Weatherization funds for this purpose. In such a home, regular Weatherization work that does not disturb painted surfaces can be done.

Funding of lead safe weatherization

Whereas DOE funds may be used to pay for Weatherization activities that disturb lead-based painted surfaces while installing energy efficiency measures or for case-by-case testing, the funds may not otherwise be used for abatement, stabilization or control of lead-based paint hazards, or routine entrance and clearance testing.

However, U. S. Department of Housing and Urban Development (HUD) funds such as Community Development Block Grant (CDBG), lead hazard control programs and HOME Repair and Rehabilitation Program funds may be used to do this work. Also, U. S. Department of Health and Human Services' (HHS) Low-Income Home Energy Assistance Program (LIHEAP), may be used for certain expenses related to Lead Safe Weatherization.

Specifically, for DOE funding, agencies should budget LSW costs under health and safety as a separate cost category, excluded from the calculation of average cost per home. Lead Safe Weatherization costs include labor, material, insurance, training, and equipment.

Liability issues

Unless an agency has specifically purchased additional insurance to cover pollution occurrences, they probably do not have sufficient insurance for their work as required by the WAP's Program Year 2002 Annual Guidance, **Weatherization Program Notice 02-1**. It is likely that their general liability insurance has a pollution occurrence exclusion.

All Arizona Sub-grantees must have liability insurance that covers work in a home with lead-based paint before any LSW work is implemented. This liability insurance does not and should not cover lead abatement projects.

Abatement projects are extensive projects designed to permanently eliminate the lead-based paint hazard. Only work that HUD refers to as "interim controls" must be covered. It is important to use this policy to demonstrate to the insurer the limited nature of the paint disturbance and the precautions being taken to avoid liability. The cost of such insurance is an allowable DOE expense, and we urge agencies to seek ways to obtain the coverage at reasonable rates.

For insurance shopping purposes, there are features about Weatherization work that local agencies should use in making the case for the lower risk associated with the nature of Weatherization work, especially when compared to lead-based paint abatement and lead hazard control work:

- Weatherization is different from lead hazard control work and involves lesser levels of work associated with painted surfaces. In fact, the disturbance of painted surfaces, by comparison, is minimal and when it happens, is incidental to the purpose of the work - the installation of energy conserving measures.

- In addition, not all weatherization work involves disturbing painted surfaces and some homes are lead free, and so the *risk basis* for insurance rates - unlike insurance for lead hazard control work - should not be based on one hundred percent operations in a lead paint environment for every home weatherized.

DOE is involved with EPA and HUD in continuing discussions with the insurance industry about ways to qualify Weatherization agencies for more favorable rates. We also welcome suggestions from state and local agencies with experience in obtaining reasonable rates for this kind of work, which we will share with the Arizona subgrantees.

Training

Arizona's WAP requires that *when disturbance of painted surfaces is significant*, Weatherization workers will use LSW practices.

Arizona's WAP will provide or recognize prior participation in the following training opportunities to sub-grantee as required, taking into consideration each subgrantees mix of action items and allowable measures:

- LSW workshops provided by trainers who are certified in The HUD Lead Safe Work Practices.
- Peer-to-Peer training.
- Individual agency training on an as needed basis.

All training will utilize the Lead Safe Weatherization curriculum developed by Montana State University.

7. Building Structure

Building rehabilitation is beyond the scope of the Weatherization Assistance Program; however, Arizona Subgrantees frequently encounter homes in poor structural condition. Dwellings whose structural integrity is in question should be referred to the Arizona Department of Housing.

Weatherization services may need to be delayed until the dwelling can be made safe for crews and occupants (see Deferral Standards).

Incidental repairs necessary for the effective performance or preservation of weatherization materials are allowed if the cost of the weatherization material and incidental repair are cost justified by the audit. Examples of these limited repairs include sealing minor roof leaks to preserve new attic insulation and repairing water-damaged flooring as part of replacing a water heater.

8. Electrical Issues

The two primary energy-related health and safety electrical concerns are 1) insulating homes that contain knob-and-tube wiring and 2) identifying overloaded electrical circuits.

Older electric wiring, primarily knob-and-tube wiring, located in a wall cavity or exposed on an attic floor was originally intended by code to have *free air movement* for that would cool the wire when carrying an electric current. Laboratory tests have shown that retrofitting thermal insulation around electric wiring can cause it to overheat, resulting in a fire hazard.

Arizona program policy requires that Subgrantees ensure that insulation around knob-and-tube wiring conforms with applicable codes in jurisdictions where the work is being performed.

Serious electrical hazards exist when gross overloads are present. Should auditors and crews find such existing problems, they must notify the owner verbally and in writing by the Subgrantee WAP program manager.

Weatherization measures that involve the installation of new equipment such as air conditioners, heat pumps, or electric water heaters can exacerbate previously marginal overload problems to hazardous levels. The problem must also be noted in the client file. To the extent that these problems prevent adequate weatherization, the agency should consider repairing them on a case-by-case basis.

9. Refrigerant Issues

The replacement of air conditioners requires Subgrantees to ensured that the requirements of the Clean Air Act 1990, section 608, as amended by 40 CFR 82, 5/14/93, be enforced. The appliance vendor, de-manufacturing center, or other entity recovering the refrigerant must possess EPA-approved section 608 type I or universal certification. Subgratnees must ensure they have appropriate protocols in place that comply with all standards relating to the disposal of the existing appliances.

10. Other Code Compliance Issues

It is the Subgrantee's responsibility to ensure that weatherization-related work conforms with applicable codes in jurisdictions where the work is being performed.

E. Deferral Standards

The decision to defer work in a dwelling is difficult, but necessary, in some cases. This does not mean that assistance will never be available, but that work must be postponed until the problems can be resolved and/or alternative sources of help are found. Note that subgrantees, including crews and contractors, are expected to pursue reasonable options on behalf of the client, including referrals, and to use good judgment in dealing with difficult situations.

Subgrantees will develop guidelines and a standardized form for such situations. The form will include the client's name and address, dates of the audit/assessment and when the client was informed, a clear description of the problem, conditions under which weatherization could continue, the responsibility of all parties involved, and the client(s) signature(s) indicating that they understand and have been informed of their rights and options.

Deferral conditions may include:

- The client has known health conditions that prohibit the installation of insulation and other weatherization materials.
- The building structure or its mechanical systems, including electrical and plumbing, are in such a state of disrepair that failure is imminent and the conditions cannot be resolved cost-effectively.

- The house has sewage or other sanitary problems that would further endanger the client and weatherization installers if weatherization work were performed.
- The house has been condemned or electrical, heating, plumbing, or other equipment has been "red tagged" by local or state building officials or utilities.
- Moisture problems are so severe they cannot be resolved under existing health and safety measures and with minor repairs.
- Dangerous conditions exist due to high carbon monoxide levels in combustion appliances, and cannot be resolved under existing health and safety measures.
- The client is uncooperative, abusive, or threatening to the crew, subcontractors, auditors, inspectors, or others who must work on or visit the house.
- The extent and condition of lead-based paint in the house would potentially create further health and safety hazards.
- In the judgment of the energy auditor, any condition exists which may endanger the health and/or safety of the work crew or subcontractor, the work should not proceed until the condition is corrected.

REFRIGERATOR REPLACEMENT POLICY

The following criterion apply to replacement refrigerators:

ELIGIBILITY FOR REPLACEMENT

Weatherization Program Notice 00-5 lists the types of refrigerators that may be installed with U.S. Department of Energy (DOE) funds. Refrigerators and refrigerator-freezers with manual, automatic, or partial automatic defrost are eligible. Units must comply with UL-250 and with energy efficiency standards established in the National Appliance Energy Conservation Act of 1987 that are periodically updated. New replacement units may **not** have through-the-door ice or water service since this feature increases energy use.

To qualify for replacement, the refrigerator replacement unit must result in a savings-to-investment ratio (SIR) of 1.0 or greater.

To determine the SIR, one of the following methods must be used to determine the energy use of the existing unit:

- Refrigerator replacement analysis tools that utilize the Association of Home Appliance Manufacturers or other approved refrigerator databases.
- Meter electric usage of the existing unit utilizing an approved meter. A list of approved meters is available from the Arizona Energy Office.

METERING REQUIREMENTS

- Meter at least 10% of units replaced — It is not required to meter every existing refrigerator that is replaced. Initially, as the program gains experience, DOE will require metering on at least 10% of the units replaced. Units that cannot be located in the Association of Home Appliance Manufacturers, or other refrigerator databases, may make up all or most of the 10% requirement.
- Meter at least 2 hours — The minimum metering duration required to obtain results accurate enough to make a reliable replacement decision has been debated for several years. DOE believes a two-hour minimum metering duration is an appropriate compromise.

MATERIALS

- New refrigerators shall:
  - Not exceed the size as the replaced unit.

- Not exceed 18 cubic feet in size.
- Have a minimum 1-year warranty.

INSTALLATION

- The electrical outlet shall:
  - Provide the voltage specified on the ID plate of the new refrigerator.
  - Be properly grounded and/or protected with a properly functioning GFIC device.
  - Be located within reach of the refrigerator without the use of an extension cord.
  - Be in good condition with nothing visibly wrong (e.g., not cracked or broken, and no spark, smoke, or burn marks, etc.).
  - Meet refrigerator manufacturer's specifications for space and clearances.

- The contractor shall:
  - Deliver and install the new refrigerator.
  - Level the unit to ensure proper operation.
  - Ensure that door hinges are on the appropriate side.
  - Instruct the customer on refrigerator operation.
  - Deliver warranties and operating manuals to the customer.
  - Set temperature controls appropriately.

DISPOSAL

- The contractor shall:
  - Take unit out of service. Make sure the existing refrigerator, removed from the house, does not find its way back onto the electric grid.
  - Dispose of unit in an environmentally responsible manner. All refrigerators replaced must be properly disposed of according to the environmental standards in the Clean Air Act of 1990, section 608, as amended by Final Rule 40 CFR 82, May 14, 1993.
  - Take unit to a de-manufacturing facility or incorporate disposal requirements in vendor contract.
  - Remove all packing materials from the customer's premises.

REPORTING

- The sub-grantee shall record the following information for both the existing and replacement refrigerators on the Household Reporting Form:
  - Manufacturer (for years available).
  - Brand.
  - Year of manufacture.
  - Model number.
  - Type (e.g., side-by-side, top freezer).
  - Database estimated kWh/yr.

- On metered units, the sub-grantee shall provide an estimated annual kWh usage and the duration of metered data.
- Provide saving to Investment Ratio for the replacement refrigerator.

WAIVERS

There may be cases were it is the best interest of the client that a refrigerator be installed that does not meet the requirements of the Weatherization Assistance Program Refrigerator Replacement Policy. In these cases, the Weatherization Assistance Program Waiver Process must be followed.

Appendix 2: 150 House Study by AEO

Present Value Analysis
SWG Low-Income Weatherization Program
July 1, 1999 to June 31, 2000

The total amount of Southwest Gas Low Income funds spend in the fiscal 99/00 program year was $166,218.58 (WACOG June report still not in). $123,295 was spent of measures that are included in the analysis. $42,923 was spent on health and safety and other repairs. $22,069 was spent on administration. Total present value for funds spent was $536,422. Saving to investment ration for Southwest Gas (SWG) funds spent on measures is 3.22.

Below is a summary of how these figures were derived.

Average cost per measure:
The Southwest Gas Low-Income funds are used in conjunction with a number of other funding sources. This results in multiple funding sources being used in a high percentage of installed measures. This requires that an average costs per unit to complete a weatherization measure be determined, allowing these values to be applied to the (SWG) funds spent on each measure. The following is a list of these average program costs for measures that used SWG funds.

Duct repair:
Air Conditioned homes: 0.83 CFM50 per dollar.
Evaporative cooling: 2 CFM50 per dollar.

Infiltration (air sealing and pressure balancing):
Air Conditioned homes: 1.5 CFM50 per dollar.
Evaporative cooling: 3.6 CFM50 per dollar.
Pressure balancing: Approximately 3 Pascals average per home.

Attic insulation:
Air Conditioned homes: Average existing insulation level of R-7, increasing to R-30 for $.30 per square foot.
Evaporative cooling: Average existing insulation level of R-2, increasing to R-19 for $.25 per square foot.

Shade screens:
$3 per square foot

HVAC equipment replacement:
AC/heating: 11.5 SEER AC and an 80% AFUE gas furnace (gas pack) average cost of $2400.
Heating only: 80% AFUE gas furnace average cost of $1300.

Present value analysis

The next step was to determine present value for each of the measures listed above. The present value analysis presented used a discount rate of 3.7%. Life of measure used in present value analysis is listed with each measure.

Duct sealing: The following values were derived by utilizing the results from the APS study on duct leakage performed by Proctor Engineering. The saving values used are very conservative and could be as much as two times the value listed because of the interaction between duct leakage, house pressures, infiltration and system efficiency. Measure life of 20 years

Low Income Weatherization Program

Climate zone	AC/Forced air heating	Evap cooling/Forced air heating
II (Phoenix)	$5.15 per CFM50 reduction	$.65 per CFM50 reduction
III (Prescott)	$3.3 per CFM50 reduction	$2.50 per CFM 50 reduction
IV (Tucson)	$3.70 per CFM50 reduction	$.70 per CFM50 reduction
VI (Yuma)	$9.00 per CFM50 reduction	$.35 per CFM50 reduction

Infiltration: The following values were derived using REM/design Software. Measure life of 20 years

Climate zone	AC/Forced air heating	Evap/Forced air heating
II (Phoenix)	$.29 per CFM50 reduction	$.22 per CFM50 reduction
III (Prescott)	$.59 per CFM50 reduction	$.59 per CFM 50 reduction
IV (Tucson)	$.26 per CFM50 reduction	$.23 per CFM50 reduction
VI (Yuma)	$.50 per CFM50 reduction	$.14 per CFM50 reduction

Attic Insulation: The following values were derived using REM/design Software. Measure life of 20 years

Climate zone	AC/Forced air heating R-7 to R-30	Evap/Forced air heating R-2 to R-19
II (Phoenix)	$1.02 per square foot	$.23 per square foot
III (Prescott)	None completed	$.70per square foot
IV (Tucson)	$.85 per square foot	$.23 per square foot
VI (Yuma)	$.98 per square foot	$.20 per square foot

Shade Screens (AC only): The following values were derived using the REM/Design software. Measure life of 7 years

Climate zone	Shade Screens
II (Phoenix)	$13 per square foot
III (Prescott)	None completed
IV (Tucson)	None completed
VI (Yuma)	None completed

HVAC Equipment Replacement: The following values were derived using the REM/Design software. Measure life of 15 years

Climate zone	11.5 SEER 80% AFUE	80% AFUE
II (Phoenix)	$7685	$745
III (Prescott)	None completed	None completed
IV (Tucson)	None completed	$827
VI (Yuma)	None completed	None completed

Dollars per measure spent

By determining the total dollars spent per measure and applying it to the average cost of measure and present value amount, an estimate of the total present value for the SWG low-income program can be determined. To achieve this, the total dollar amount of SWG funds spent per measure is multiplies by the average cost to determine the total amount of the measures completed with SWG funds. The total amount of measure completed is multiplied by the unit present value of the measure to estimate the present value for each measure. ***note, infiltration saving for pressure relief not included**.

Low Income Weatherization Program

Climate zone II:

Measure	Dollars spent on measure	Units completed per dollar	Total units completed	Present value per unit	Present value for measure
Duct repair/AC	$24,618	.83 CFM50	20,433 CFM50	$5.15	$105,230
Duct repair/Evap	$24,326	2 CFM50	48,652 CFM50	$.65	$31,624
Infiltration/AC	$3,682	1.5 CFM50	5,523 CFM50	$.28	$1,602
Infiltration/Evap	$10,936	3.6 CFM50	39,370 CFM50	$.22	$8,661
Attic insulation/AC	$10,949	3.3 sq. ft.	36,132 sq. ft.	$1.02	$36,854
Attic insulation/Evap	$8,090	4 sq. ft.	32,360 sq. ft.	$.23	$7,443
Shade screens	$1,950	.333 per sq. ft.	649 sq. ft.	$13	$8,437
AC/Heating systems	$14,682	.00041 ($2,400 per system)	6	$7,685	$46,110
Heating systems	$7,667	.00077 ($1,300 per system)	5.9	$745	$4,396
Totals	$106,900				$250,357

Climate zone III:

Measure	Dollars spent on measure	Units completed per dollar	Total units completed	Present value per unit	Present value for measure
Duct repair/AC	None				
Duct repair/Evap	$586	2 CFM50	1,172 CFM50	$2.50	$2,930
Infiltration/AC	None				
Infiltration/Evap	None				
Attic insulation/AC	None				
Attic insulation/Evap	$302	4 sq. ft.	1,208 sq. ft.	$.70	$846
Shade screens	None				
AC/Heating systems	None				
Heating systems	None				
Totals	$888				$3,776

Climate zone IV:

Measure	Dollars spent on measure	Units completed per dollar	Total units completed	Present value per unit	Present value for measure
Duct repair/AC	$63	.83 CFM50	52 CFM50	$3.70	$192
Duct repair/Evap	$6,611	2 CFM50	13,222 CFM50	$.70	$9,255
Infiltration/AC	None				
Infiltration/Evap	$278	3.6 CFM50	1001CFM50	$.23	$230
Attic insulation/AC	$100	3.3 sq. ft.	330 sq. ft.	$.85	$281
Attic insulation/Evap	$2,990	4 sq. ft.	11,996 sq. ft.	$.23	$2,759
Shade screens	None				
AC/Heating systems	None				
Heating systems	$3,475	.00077 ($1,300 per system)	2.6	$827	$2,150
Totals	$13,517				$14,867

Climate zone VI:

Measure	Dollars spent on measure	Units completed per dollar	Total units completed	Present value per unit	Present value for measure
Duct repair/AC	$104	.83 CFM50	86 CFM50	$9.00	$774
Duct repair/Evap	None				
Infiltration/AC	$1,444	1.5 CFM50	2166 CFM50	$.50	$1,083
Infiltration/Evap	None				
Attic insulation/AC	$442	3.3 sq. ft.	1,459sq. ft.	$.98	$1,430
Attic insulation/Evap	None				
Shade screens	None				
AC/Heating systems	None				
Heating systems	None				
Totals	$1,990				$3,287

House of Refuge East

$20,000 of SWG funds were transferred from the Tucson Urban League to the city of Mesa for the House of Refuge East project. This project was analyzed individually because of the specific information available for the project. A total of 86 homes were completed. The homes have AC and gas forced air furnaces. Duct repair, shade screen and pre-set thermostats were installed.

Present Value Analysis:

Duct repair: Duct leakage reduction was measured at between 150 CFM50 and 200 CFM50 per home. For the analysis, 150CFM50 reduction was used as an average per home.
86 homes X 150 CFM50 = 12,900 CFM50 total duct leakage reduction for the project.
12,900 X $5.15 present value per CFM50 = $66,435 present value for duct repair.

Shade screens: Shade screens were added to all homes where needed. A total of 3,300 sq. ft. of screens were install for $10,000.
3,300 X $13 present value per sq. ft. of screen = $42,900 present value for shade screens.

Thermostats: All homes were equipped with a pre-set, non-adjustable thermostat at a total cost of $4,900. The set points of existing thermostats were recorded during this project with majority set below 75°. The new thermostats are pre-set at 68° for heating and 78° for cooling. For this analysis, original set points of 70° for heating and 76° for cooling was used.
Present value (10 year life) per home for a set back of 2° for heating and cooling equals $1,800.
86 X $1,800 = $154,800 present value of pre-set thermostats.

The total present value for the House of Refuge East project is $264,135.

Total Present Value

Climate zone II	$250,357
Climate zone III	$3,776
Climate zone IV	$14,867
Climate zone VI	$3,287
House of Refuge	$264,135
Total	$536,422

TERMS

CFM50: CFM50 is the airflow (in cubic feet per minute) from the Blower Door fan needed to create a change in building pressure of 50 Pascals (0.2 inches of water column). A 50 Pascal pressure is roughly equivalent to the pressure generated by a 20 mph wind blowing on the building from all directions. CFM50 is the most commonly used measure of building airtightness and gives a quick indication of the total air leakage in the building envelope.

CFM50 reduction: The reduction in the measured CFM50 airflow from a Blower Door test resulting from the completion of house or duct air sealing.

REM/Design Software: This user- friendly, yet sophisticated, software calculates heating, cooling, domestic hot water, lighting and appliance loads, consumption, and costs based on a description of the home's design and construction features as well as local climate and energy cost data. Additionally, **REM/*Design*™** is DOE-approved for Weatherization Assistance Programs in all states.

Low Income Weatherization Program

Appendix 3 – Benefit Cost Calculations

WAP Rules and Calculations for AEO (Zone III Evap - Zone IV Heating System)						Conversion for ACC Report		
Measure	**Dollars spent on measure**	**Units completed per dollar**	**Total units completed**	**Present value per unit**	**Present value for measure**	**Life**	**Discount Rate**	**Future Value**
Duct repair/AC	$63	.83 CFM50	52 CFM50	$3.70	$192	20	3.7%	($37)
Duct repair/Evap	$6,611	2 CFM50	13,222 CFM50	$0.70	$9,255	20	3.7%	($30)
Infiltration/AC	None							
Infiltration/Evap	$278	3.6 CFM50	1001CFM50	$0.23	$230	20	3.7%	($29)
Attic insulation/AC	$100	3.3 sq. ft.	330 sq. ft.	$0.85	$281	20	3.7%	($31)
Attic insulation/Evap	$2,990	4 sq. ft.	11,996 sq. ft.	$0.23	$2,759	20	3.7%	($29)
Shade screens	None							
AC/Heating systems	None							
Heating systems - With absence of AEO Data for Prescott, used Zone	$3,475	0.00077 ($1,300 per system)	2.6	$2,481	$6,451	15	3.7%	($4,298)

UNSG

ESTIMATE OF ADDITIONAL kWH SAVINGS		kWh Reduction	kW Reduction	Life
CFL Replacements	Three (3) 60 watt incandescent to three (3) 15 watt CFL w/15 watt lamp (4 hours/day)	197	0.14	7
Refrigerator Replacements	Admiral 1979 19 cf Single Door (1860 kWh/Yr for Year 1-7) or 2004 Baseline unit (479 kWh/Yr for Year 8-13) Replaced by 18 cf Single Door Energy Star (407 kWh/Yr)	1250	0.14	13

SUMMARY OF ESTIMATED SAVINGS FOR UNSG

Measure	**Future Value**	**% of Customers Receiving Measure**	**Fuel Savings (E or G)**	**Avg. Therm Cost or kWh Cost**	**Therm Savings/Year**	**kWh Savings/ Year**	**Non-Coincident kW Savings/Year**	**Coincident kW Savings/Year**
Duct repair/Evap	($34)	100%	G	$1.40	24			
Infiltration/Evap								
Attic insulation/AC								
Attic insulation/Evap	($30)	100%	G	$1.40	22			
AC/Heating systems								
Heating systems - See note above	($4,298)	10%	G	$1.40	307			
Install three 15 Watt CFL		100%	E	$0.09		197	0.135	0.014
Refrigerator Replacement		5%	E	$0.09		62	0.007	0.007
Totals					**353**	**260**	**0.14**	**0.02**

Residential New Construction Program, DSM Portfolio, Attachment 2

- Builder incentives for meeting Energy Star Homes® performance standards, as shown in Table 1.

Table 1: Energy Smart Homes Program Prescriptive Incentives

UES Energy Smart Home Program Incentives	
Meets ESH and Energy Star Homes® performance standards including testing and inspection protocol.	$400 per home

Delivery Strategy and Administration

The Energy Smart Homes Program will be implemented by employing the services of a qualified implementation contractor (IC) sought through a competitive bidding process. ~~UNSG~~ The IC will provide program administration, marketing, planning, coordination of builder and contractor training and consumer education activities. ~~Some program activities, such as training, incentive processing, and other program support may be provided in-house or through specialized vendors.~~

Key industry relationships will include: (1) EPA/DOE Energy Star Homes® for program branding and certification standards; (2) building Science trainers for training and education; (3) testing and inspection contractors approved by RESNET for third party performance verification and energy ratings; (4) the Arizona Energy Office for support in all areas; and (5) local code officials.

~~UNSG~~ The implementation contractor and UNSG representatives will develop key trade ally relationships including: (1) builders; (2) energy experts able to provide design assistance and building energy simulation modeling; (3) HVAC Contractors for sizing, installation and start-up of HVAC systems; (4) framing Contractors for framing and blocking detail to enhance insulation performance; and (5) insulation Contractors for insulation installed according to specifications.

Program logic model is included in Appendix 4.

Marketing and Communications

The goal for marketing the ESH is to educate consumers on the benefits of Energy Star Home® performance standards and promote builders who provide Energy Star Home® products. Marketing is necessary to drive the consumers to homebuilders who adhere to these performance standards. As more consumers demand the product, more builders will choose to build to ESH standards. Higher participation by builders results in higher quality and more energy efficient homes being built in the UNSG service territory.

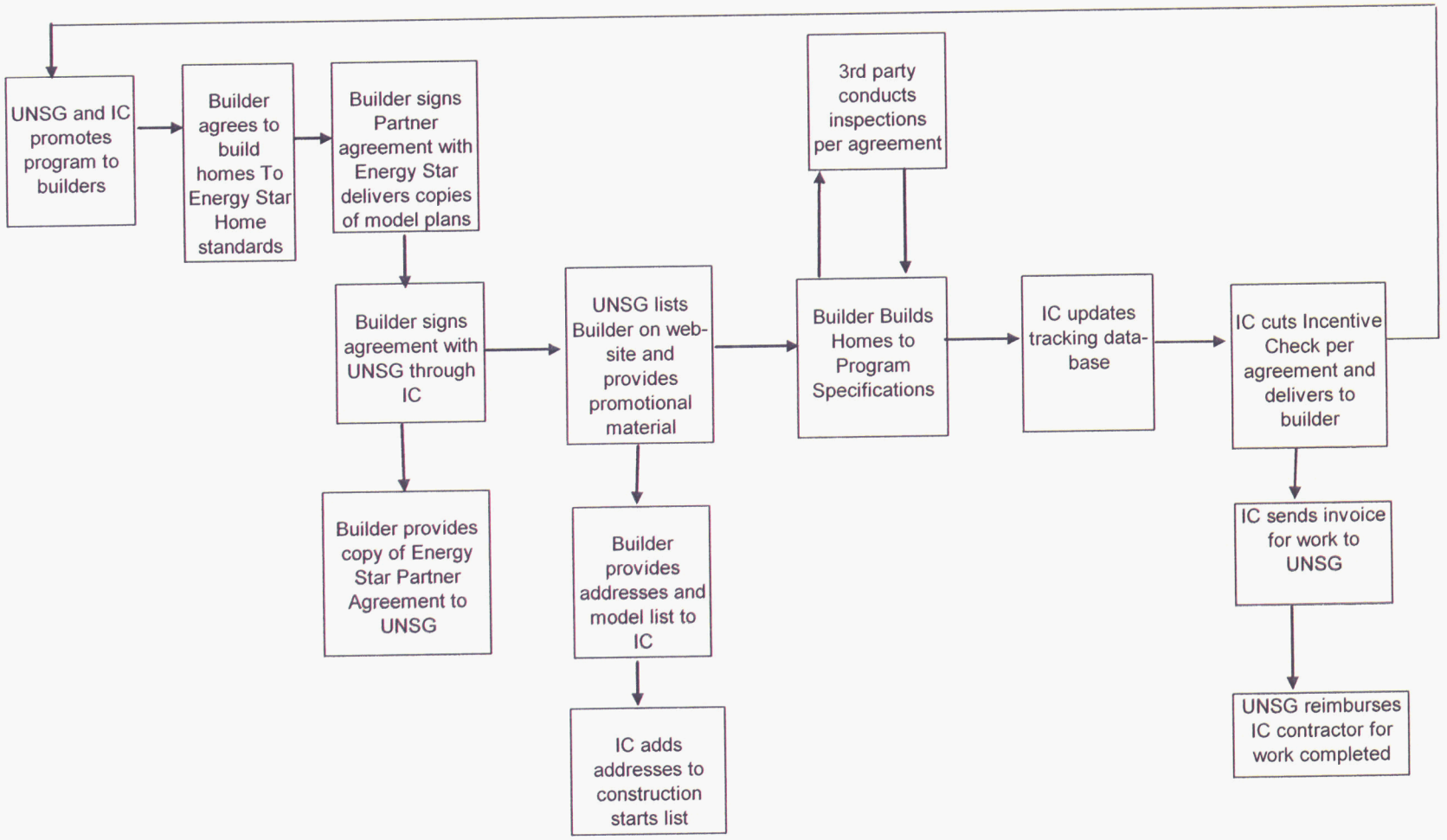
~~UNSG~~ The IC and UNSG will provide the following marketing and promotional support:

For Builders:

- Advertisements and article placements in builder trade publications;
- Direct sales through builder account representatives;
- Point-of-Sale materials and sales tools;
- UNSG Web-site; and

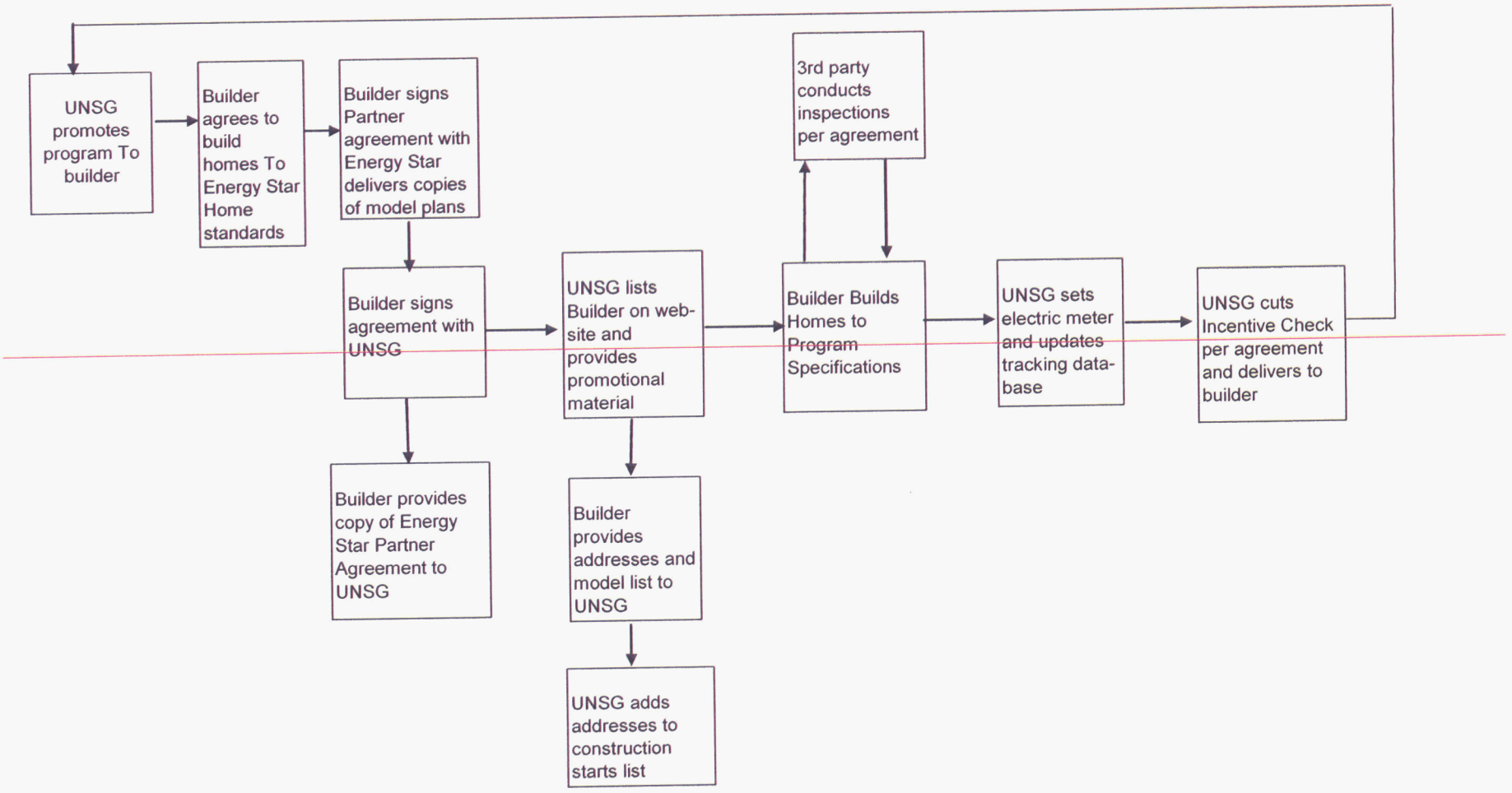
UNSG Residential New Construction Program

Appendix 4 - Program Implementation Model



UNSG Residential New Construction Program

Appendix 4 - Program Implementation Model



Efficient Home Heating Program, DSM Portfolio, Attachment 3

Efficient Home Heating Program

Program Objectives

The objective of the program is to promote the purchase of Energy Star qualified high-efficiency furnaces that meet or exceed the minimum Energy Star standard of 90% AFUE.

Products and Services

The products and services provided by the program include:

- Incentives to homeowners for the installation of qualifying high-efficiency furnaces. Incentives and qualifying criteria are summarized in Table 1.

Table 1. Incentives Schedule

Measure	Qualifying Criteria*	Average Incentive**
High Efficiency Furnaces	Minimum AFUE of 90%	$244
Packaged Air Conditioners with High-efficiency Furnaces	90 AFUE or better furnace with CEE Tier 1 or 2 AC rating	$254
* Consortium for Energy Efficiency ("CEE") is an independent rating agency. ** Incentives vary depending on unit heating capacity and efficiency. See appendix 3 for details on incentive levels		

- Marketing costs include compensation of $25 per unit paid to contractors to encourage program promotion and offset costs associated with detailed reporting required on each project~~.~~.
- Education and promotional efforts designed to inform customers about the benefits of high-efficiency heating systems including educational brochures, program promotional material, and UNSG website content.

Delivery Strategy and Administration

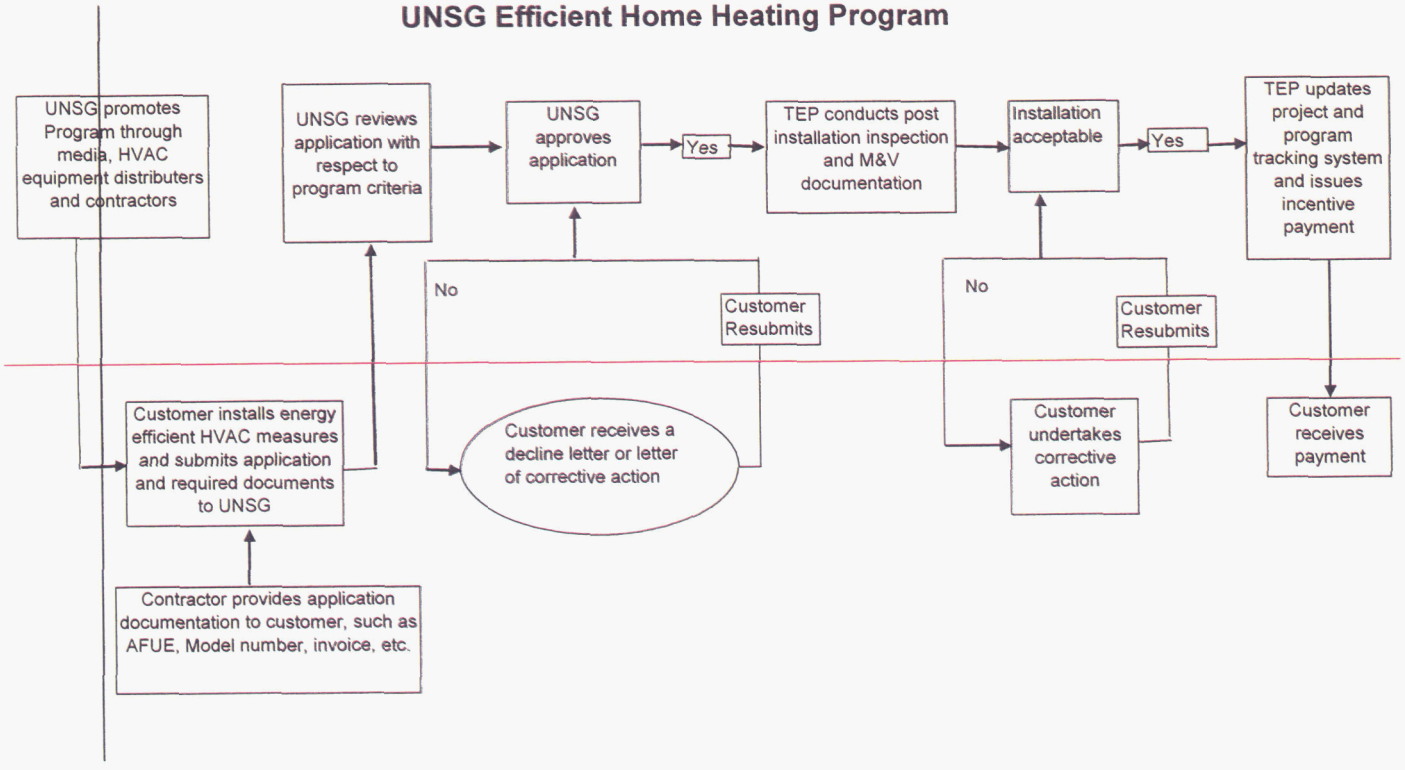
The strategy for program delivery and administration is as follows:

- The Efficient Home Heating Program will be implemented jointly by a qualified implementation contractor (IC) selected through a competitive bidding process and an in-house Program Manager. ~~The program will be managed in house by UNSG staff;~~
- UNSG will provide overall program management, ~~marketing,~~ planning and coordination of customer and contractor participation. The IC will verify equipment efficiency, process rebates, provide marketing, tracking and technical support and evaluation;
- Key partnering relationships will include:
  - Heating training professionals;
  - Heating contractors trained in program procedures; and
  - The Arizona Energy Office to provide training, education and awareness.

Program implementation flow chart is included in Appendix 1.

Appendix 1 – Efficient Home Heating Program Implementation Plan

UNSG Efficient Home Heating Program



UNSG Residential HVAC Retrofit Program

Appendix 1 - Program Implementation Model